
REPORT

OF THE

HUDSON'S BAY EXPEDITION,

UNDER THE COMMAND OF

LIEUT. A. R. GORDON, R.N.,

1884.

REPORT
OF THE
HUDSON'S BAY EXPEDITION,

UNDER THE COMMAND OF
LIEUT. A. R. GORDON, R.N.,
1884.

METEOROLOGICAL OFFICE, TORONTO.

The Honorable A. W. McLELAN,
Minister Marine and Fisheries,
Ottawa.

SIR,—I have honour to submit, herewith, my report on the conduct of the Hudson's Bay Expedition of this year, under my command.

I desire to acknowledge the cordial assistance and co-operation which I received from Dr. Bell, who was appointed as medical officer and geologist to the expedition; and also from Mr. W. W. Fox, who accompanied the expedition as a volunteer. Both Mr. Fox and Dr. Bell took large numbers of photographs of the various posts and the scenery of the coast. Mr. Fox also made free-hand sketches of the coast profile, at many points, for me.

Dr. Bell's report forms Appendix A to this Report.

Appendix B is a series of tables showing temperature, &c., at Fort Chimo, in Ungava Bay, taken by Mr. Lucien M. Turner, of the United States Signal Service, which he has favored us with, by kind permission of General Hazen, the chief signal officer of the United States army.

Of the officers and men forming the staff of the expedition, it gives me much pleasure to report that they, each and all, performed the several duties assigned to them in the most satisfactory manner.

The Report submitted herewith is divided into the following sections:—

- 1st. Narrative.
- 2nd. Navigation—including Ice, Currents and Meteorological Observations.
- 3rd. Resources of the Region.
- 4th. Trade.
- 5th. Natural History, Inhabitants and Fauna.
- 6th. Proposed Work for next Year.

Appendix A.—Report of R. Bell, Esq., M.D., F.G.S.

Appendix B.—Observation, at Ungava Bay, by L. M. Turner, Esq., United States Signal Service.

I have the honour to be, Sir,

Your obedient servant,
ANDREW R. GORDON, Lieut., R.N.,
Commanding H. B. Expedition.

The Honorable A. W. McLELAN,
Minister Marine and Fisheries,
Ottawa.

SIR,—I have the honour to report, relative to the Hudson's Bay Expedition, that, in accordance with your letter of instructions, dated 5th July, I proceeded to Halifax, N.S., and took charge of the preparations for the expedition.

On the 14th of the same month I received the following note from Messrs. S. Cunard and Co. :—

"HALIFAX, N.S., 14th July, 1884.

'Lieut. A. R. GORDON, R.N.,
"Halifax, N.S.

"DEAR SIR,—In accordance with instructions received from Messrs. Job Bros., we
"this day hand over to you the S.S. 'Neptune,'

"Yours truly,

"S. CUNARD & CO., Agents."

The "Neptune" having been placed at the disposal of the Department, the greatest dispatch was used in coaling and putting on board the supplies for the expedition, and at two o'clock in the afternoon of Tuesday, 22nd July, the coals, lumber and other supplies being on board, the members of the expedition embarked, and one hour later we left our moorings at the Marine Wharf for Hudson's Bay.

The staff of the expedition was composed as follows:—

Robert Bell, M.D., F.G.S., of Ottawa, geologist and medical officer.

Messrs. R. F. Stupart, of Toronto; C. R. Tuttle, of Winnipeg; W. A. Ashe, of Quebec; C. V. Deboucherville and A. N. Laperriere, of Ottawa; William Skynner, of Springfield, Ont.; H. M. Burwell, of London, Ont.; and H. T. Bennett, observers.

Mr. W. W. Fox, of Toronto, photographer.

Messrs. Yeadon, McNeill and Quigley, carpenters.

Messrs. R. Currie, J. E. Campbell, H. M. Rainsford, W. H. Jordan, M. W. Keating, Fred. Drysdale, Jno. W. Chaplin, John W. McDaniel, W. F. Esdaile, Andrew Inglis, Adam Maher and Robert Youill, stationmen.

The officers and men, who remained out all winter, had each of them been examined by medical men, and pronounced physically well-fitted to withstand the rigors of an Arctic climate.

The expedition touched at Blanc Sablon on the 26th of July, and on the evening of Tuesday the 29th anchored in Ford's Harbour, at the east end of Paul's Island. At this place I went on shore and arranged with Mr. Ford to pilot us into Nain. He boarded the "Neptune" at daylight the following morning, and by nine o'clock we had anchored off the Nain Mission House.

I visited this place in the hope of obtaining furs for the men who were to remain at the stations during the winter, and of being able to engage Eskimo interpreters. I secured a few articles of fur clothing, but there were no interpreters to be had. The Chief Superintendent of the Mission told me, however, that, in all probability, I would be able to procure some fur clothing, and interpreters as well at the Hudson's Bay Co.'s Post at Nachvak, still further to the north, on the Labrador coast.

We remained at Nain during the day and were kindly treated by the missionaries who, besides imparting religious instruction to the natives, carry on an extensive trade with them. They have six stations in all on this coast, of which Nain is the capital. The others are Hopedale, Zoar, Hebron, Okkak and Ramah. During the day I took observations to ascertain the dip of the magnetic needle and vibrations for horizontal force, but was unable to obtain sights for the error of the chronometer or variation, owing to the inclemency of the weather.

During the voyage from the Gulf of St. Lawrence to this place we met with a great number of icebergs, both in the Straits of Belle Isle, and off the Labrador coast, north of it.

The expedition left Nain about 4:30 o'clock on the morning of 31st July, and reached Nachvak Bay about noon on the 1st of August, and cast anchor before the Hudson's Bay Co.'s post at Nachvak, about 4 o'clock in the afternoon. Here I met Mr. George Ford, the agent of the Hudson's Bay Company and a brother of our Nain pilot. From him and from the natives in the vicinity I purchased some skin clothing, and through his kind assistance was enabled to procure the services of Mr. James Lane, an Eskimo half-breed of Nachvak Bay as interpreter.

I learned from Mr. Ford that ice takes over the harbour of Nachvak, latitude $59^{\circ} 10' N.$, longitude $63^{\circ} 30' W.$, about the middle of November in each year and that for the last seven years it has broken up within a day of the 26th of June in each year.

On the 2nd of August, at daylight, we left the post at Nachvak, and after taking Mr. Lane on board at the mouth of the Bay, proceeded to sea for Cape Chidley. On the morning of the 3rd—Sunday—the fog was so dense that we were compelled to stand off to sea, and lie to. Noon position, lat. $60^{\circ} 51' N.$, long. $64^{\circ} 14' W.$, D. R.

The fog continuing, we were obliged to lay to all day Sunday, all night Sunday night, all day Monday, and all night Monday night, off the entrance to Hudson Strait. Noon position Monday, 4th August, D. R. lat. $61^{\circ} 12' N.$, long. $64^{\circ} 13' W.$

At daylight on Tuesday, 5th August, the weather was clearing, and by sunrise it was bright and fair. At noon we were approaching Cape Chidley, having been carried some forty miles to the south whilst laying-to in the fog. We steamed through Grey Strait, between the Cape and the Button Islands, keeping a close look out for a harbour. At three o'clock in the afternoon we anchored in a fine harbour on the north-western shore of the Cape, at the entrance to Ungava Bay.

On the shore of this harbour I selected the site for Observing Station No. 1, and named the place Port Burwell, after the observer appointed to that station. Two families of Eskimos were discovered about six miles distant from Port Burwell.

The work of landing lumber and supplies was begun at once, and by 4 o'clock on the afternoon of Friday the 8th, the buildings were up and all was in readiness for departure. I placed Mr. H. M. Burwell, of London, Ontario, in charge of this station, with Messrs. Currie and Campbell as stationmen, and besides giving him full directions verbally, left with him, as also with each of the other observers, a copy of the following general instructions:—

INSTRUCTIONS TO OFFICERS IN CHARGE OF STATIONS IN HUDSON'S BAY AND STRAITS.

As the primary object of the whole expedition is to ascertain for what period of the year the Straits are navigable, all attention is to be paid to the formation, breaking up and movements of the ice.

Each station is supplied with a sun dial and time piece, and the clock is to be tested each day when there is sunshine about noon. A table of corrections is supplied for the reduction of apparent time to local mean time, to this the difference of time will be applied to 75th meridian, all entries being made in the time of this meridian, and observations will be taken regularly at the following times throughout the year, viz., 3 h. 08 m., 7 h. 08 m., 11 h. 08 m., a.m. and p.m.

Each morning the sums and means of the observations taken on the previous day will be taken out and checked over, they will then be entered in the abstract books supplied for the purpose.

After each observation during day light the observer on duty will take the telescope and carefully examine the Straits, writing down *at the time* all that he sees, stating direction and (when possible) velocity of tide, movement of ice, if any, also describe the condition of the ice, whether much broken up, solid field, &c., &c.

Tidal Observations.—Each day the time and height of high and low water is to be carefully observed, and during the open season the character of the tide will be carefully noted for two days before and three days after the full and change of the moon. For this purpose a post marked off in feet and fractions of a foot is to be placed in the water, at low water in some sheltered spot, if any such be available,

and the height of the water noted every half hour during the rise and fall of one tide on each of these days—the height to be noted most carefully every five minutes during the hour of high water and the same at low water—the five minute observations will also be taken for one hour during the most rapid portion of the rise. Special observations of barometric pressure are to be taken in connection with these tidal observations.

To check the zero mark for the tidal observation post, select a spot on shore from which the horizon line will be projected on the tidal post, and record the reading of this line when seen projected on the post by the observer, whose eye is to be placed at a measured height above the datum point selected on shore.

All remarks in regard to the movements of birds, fish, &c., and also as to the growth of grasses, will be carefully entered.

As it is impossible to give to the officers in charge of stations detailed instructions which would be of service in every contingency which might arise, the officers are required to observe and enforce the following rules:—

(a.) Every possible precaution is to be taken against fire, and as it is anticipated that the temperature can be maintained considerably above the freezing point inside the houses, two buckets full of water are always to be kept ready for instant use.

(b.) As the successful carrying out of the observations will, in a great measure, depend on the health of the party, the need of exercise is strongly insisted on during the winter months, and also that each member of the party shall partake freely of the lime juice supplied.

(c.) Each party is supplied with a boat, but unless some emergency required it, it must be a rule that neither afloat nor ashore must any of the party leave the station for a greater distance than they can be sure of being able to return the same day.

(d.) As soon as possible after the houses are completed and the stores all in place, the party will set to work collecting sods, grass or any other non-conducting material, and before the winter sets in the whole house is to be covered with this, boards overlaid and snow packed over all; the assistance of the Esquimaux should, if possible, be obtained, and the whole house arched over with snow.

ANDREW R. GORDON, Lieut. R.N.,

Commanding Expedition.

OTTAWA, 5th July, 1884.

The expedition left Port Burwell at 5 o'clock on the evening of the 8th, and shaped course for the Lower Savage Islands, where it was intended that Station No. 2 should be placed. On the following morning there was a dense fog until 8 o'clock, when it lifted, and at 9 o'clock we sighted Resolution Island. We passed a number of icebergs in the forenoon, and passed between Resolution Island and the Lower Savage Islands to East Bluff, then going about and steering along the south coast of the Lower Savages.

We spent the day in looking for an anchorage at the Lower Savages, and on a portion of the north main coast, a boat was sent ashore twice to examine what appeared to be possible harbours; but, on both occasions, the report was unfavourable; there was a stiff breeze blowing all day. At nightfall we pushed out into the Strait and laid to until morning, when it was intended to renew the search. At daylight on the morning of the 10th, we steamed shorewards and examined part of the coast north of the Lower Savages, but a heavy snow storm setting in, with a fresh gale from the south-east, and a falling barometer, I decided to abandon Resolution Island Station for the time being, and push on towards North Bluff. The latter place was reached about 4 p.m., on Monday, the 11th, after working our way through some open stretches of ice. Here we found a good anchorage on Big Island (called by Schwatka, Turenne Island), which forms the southern side of North Bay.

A suitable place was selected for the station buildings, and the place was called Ashe's Inlet, after Mr. W. A. Ashe, the observer assigned to that station.

We found here a number of Eskimos, who seemed to be much pleased at seeing white people coming into their country.

We were delayed a good deal at Ashe's Inlet by bad weather and by the field ice coming into the harbour and interfering with the work of landing lumber and supplies, but at noon on the 16th all was in readiness for the start. I left with Mr. Ashe, for the time being, Mr. Skynner and his two men, Messrs. Rainsford and Jordan, whom I was unable to place on Resolution Island, and at 2:30 the "Neptune" was directed towards the south shore of the strait, and at 8 o'clock on the morning of the 17th we sighted the north-west shore of Prince of Wales Sound.

On approaching the land, we forced our way through about twelve miles of field-ice, more or less compact. Towards the shore the ice was more open, and much of it was aground in three and four fathoms of water. We anchored about 2 p.m. in a well-sheltered bay, about three miles along the north-west coast of the sound, from the south main shore of the strait. A few minutes later a number of Eskimos were seen on shore. They were very much delighted when they learned that we were going to establish a station among them. I named this place Stupart's Bay, after Mr. R. F. Stupart, the observer assigned to that station.

On account of the magnetic observations to be taken, two extra buildings were required at this station, but notwithstanding the extra work to be done, everything was in readiness for our departure on the evening of the 22nd.

Accordingly we left Stupart's Bay on that evening, and had to work our way through about eighteen miles of more or less compact field ice. We laid-to in the ice all night. On reaching the open water we shaped our course so as to clear the eastern point of Charles Island, after clearing which we steamed towards Nottingham Island, and succeeded in making a good harbor on the south-east shore of that island about 3 o'clock on the 24th.

On approaching Nottingham Island we found very heavy ice, extending for some fifteen or twenty miles eastward from that island and Salisbury, filling the channel between these islands and extending southward towards Cape Wolstenholme as far as we could see.

On approaching the harbour we had the misfortune to break one blade off the propeller. Fortunately a spare fan had been brought in the ship, and beyond the work entailed by unshipping the broken one, fitting the shaft in the new one and getting it into position, which occupied the engineers about three days, we suffered no damage in consequence.

Soon after our arrival at Nottingham we sighted four vessels in the channel between us and the south main shore. They were about twelve miles distant, and fast in the field ice. Later we passed near enough to one to observe that she was bark rigged, and probably the outgoing Hudson Bay Company's vessel, and to another, an American whaling schooner, to exchange salutes with her by dipping ensigns.

We met with no natives at Nottingham Island. The work of erecting station buildings and landing the supplies occupied us until the morning of the 29th, when, at 9 o'clock a.m., having taken leave of Mr. C. V. DeBoucherville, the observer assigned to that station, and his men, Messrs. Esdaile and Inglis, we left the harbour, which I had called Port DeBoucherville, and steamed out among the ice towards Mansfield Island.

We found the ice exceedingly heavy and closely packed, so much so that after ramming our way some five miles out, and while yet within sight of the harbour, we were compelled to lay to until the change of tide should loosen it. After three hours' waiting, we again went ahead with the engines, the ice having run abroad a little; but when darkness closed upon us, we were still in the ice and were compelled to lay to until the morning.

Soon after daylight on Saturday morning, the 30th, we got out of the ice into the open water of Hudson's Bay, and by 7 o'clock sighted the low, barren shores of Mansfield Island. According to the original plan, a station was to have been placed on this island, but after coasting its eastern shores without finding an anchorage, I decided, about 7 o'clock in the evening, to abandon it altogether, and push on across the bay, in the hope of being able to place a station on Cape Digges on the return voyage.

Meanwhile, however, I proposed to examine the shores of Southampton Island, which lies to the north-west of Mansfield, with a view of ascertaining if that would be a more suitable place for a station. I did this on Sunday, skirting the south-east shore from Cape Southampton, some fifty miles, without finding an anchorage.

We then directed our course towards the north-west of the bay, in order to visit Marble Island, and to see if the northern part of the bay was free of ice. At noon on the first day of September we were off the mouth of Chesterfield Inlet, no ice having been sighted.

We then bore up for Marble Island, where we arrived early in the morning of 2nd September, and anchored in the Whalers' Harbour at the south-west of the island, and remained until seven o'clock in the evening.

During the day I took observations to ascertain the latitude and longitude, the variation of the compass and the dip of the magnetic needle, and in the afternoon made a hurried survey of the harbour.

We were somewhat disappointed at not finding native or other inhabitants on the island, and surprised at seeing so many evidences of the dead, there being no less than nineteen graves on Dead Man's Island, which forms the southern side of the harbour, and a monument commemorating the death of six more who had been drowned in a whale boat, in the "Welcome."

While at Marble Island I found a letter that had been left in a bottle by Capt. Fisher, of the whaling bark "George and Mary," that had wintered in the harbour. The letter was probably intended for one of the out-going whaling vessels. I made a copy of the letter, which is as follows:—

"Aug. 7, 1884.—On board the bark "George and Mary," Marble Island. All well. Three whales. The north part of the bay has been filled with ice since the 10th of July. Could not get up the Welcome, nor to the east shore. Had a very cold winter and spring. On the 23rd of May the thermometer was 4° below zero. Got out the 7th of June. Laid in the outer harbour all winter. No natives came to the ship while we lay at Marble Island. Had plenty of scurvy, but came out of it all right. Shall stay in the Welcome until the last of August, then start for home if nothing happens.

“(Signed), E. B. FISHER,
of the 'George and Mary.'”

From Marble Island we directed our course towards Churchill, meeting with heavy weather on the voyage, and arriving off the mouth of the Churchill River on the evening of the 3rd. Owing to heavy north-west winds, fog, and to our not being acquainted with the approach to Churchill Harbour, we were compelled to lay-to off Cape Churchill until the forenoon of the 6th, when, the weather clearing, we steamed into the harbour and anchored.

At this place I received and accepted the resignation, owing to ill-health, of Mr. C. R. Tuttle, who had been appointed observer at Churchill, and arranged with Mr. Spencer, the agent of the Hudson's Bay Company stationed there, to take the required meteorological observations, engaging, on behalf of the Government, to pay him a salary of \$120 per year.

We remained at Churchill, taking ballast, &c., until the 9th, when, about 7 o'clock in the evening, we started for York Factory.

I must acknowledge the extreme kindness and generous attention extended to the expedition by the officers of the Hudson's Bay Company at Churchill. They did all in their power to make our visit pleasant, and to supply me with fur clothing, &c.

We arrived in sight of the beacon at York Factory on the morning of the 11th, and anchored in the roadstead, some eighteen miles distant from the Factory, at ten o'clock in the forenoon, and signalled for a York boat, which was pushed off at once, but which, owing to contrary tide and wind, did not reach us until 5 o'clock in the evening.

Mr. Cowie, chief accountant of the post, accompanied the boat out, and he kindly undertook to take us in and bring us out again the next day. We arrived at the

Factory about 3 o'clock on the morning of the 12th, and left again at 3 in the afternoon.

Mr. Wood, storekeeper at York, has been observer in connection with the meteorological office for some years. I compared his instruments and adjusted them, and found his meteorological work all well done, and the observer much interested in the work.

I obtained some additional clothing from Mr. Fortescue, the chief factor at that post, and, as at Churchill, was most hospitably received by all the officers of the company.

We reached the "Neptune" in the York boat about 5 o'clock in the evening of the 12th, and weighed anchor at 7, and shaped our course for Cape Digges.

We found a good harbour on the south-western extremity of the larger Digges Island, and anchored on the morning of the 16th. Here I decided to place a station, in charge of Mr. Laperriere, and called the place Laperriere Harbor. I regarded the place as most suitable for a companion station to that of Port DeBoucherville. The distance between the two is about forty-five miles, and, as the vast stretches of ice that we met with between Nottingham and Digges on both the outward and homeward voyages, made that channel a point of the greatest importance, I consider it as desirable that the two stations should be established there.

On the morning of 20th September, the buildings having been completed and supplies landed, I prepared for departure. Mr. Laperriere was placed in charge of the station, with Messrs. Quigly and Maher as stationmen. I substituted Mr. Quigly, one of the carpenters, for Mr. Youill, whose condition of health rendered him unfit to be left there.

On the homeward voyage the expedition touched at Port DeBoucherville, Ashe's Inlet and Stupart's Bay, leaving such furs and other clothing as I had obtained for the comfort of the men. At Ashe's Inlet I took on board Messrs. Skynnor, Rainsford and Jordan, and left with Mr. Ashe, Messrs. Keating and Drysdale, the men originally intended for that station.

From Stupart's Bay we made for Resolution Island, hoping to be able to place a station on the shores of that island. Arriving on the west coast of the island on the morning of the 26th of September, we coasted along in search of a harbour. At 9 o'clock a boat was sent in to examine a bay that promised well. The vessel followed some distance astern, going dead slow, with a look-out man on the jib-boom. Leads were going from both the boat and the ship. Presently the boat reported only four fathoms; a little distance astern we had ten fathoms from the ship. In canting the ship, there being a strong northerly breeze, and the tide setting to the southward, the vessel struck a sunken rock and remained there, grinding a little at each sea, for about nine minutes. She was, however, worked off without sustaining much serious damage. A piece of wood came to the surface, supposed to be one of the scarf pieces butting on the stem plates.

We steamed further down the coast to the south-east, when about noon another bay was discovered. The mate was again sent in, in charge of the boat, to make soundings. At length he returned and reported a good harbour. We steamed slowly in, following as nearly as possible, the boat track, the engines alternately going dead slow and stopping. The lead was going constantly, and there was a look-out in the fore-top and one on the jib-boom. At 1 o'clock while the leadsman was reporting "twelve fathoms and no bottom abreast of the main rigging, the ship suddenly struck forward and the men on the look-out shouted "go astern." The ship struck very heavily and rolled two or three times. As she rebounded her engines were reversed and she was put out to sea at once.

We coasted along to Cape Best, but as there were no signs of a harbour, and as the wind was threatening a gale, and a heavy cross sea running, and as the ship had struck twice and received considerable damage, Captain Sopp advised that the station on Resolution Island be abandoned, and I felt, under all the circumstances, bound to abandon it. We had examined over sixty miles of the coast, and altogether we had expended nearly three days steaming in search of a harbour. I therefore requested

the Captain to shape our course for Port Burwell, and in that excellent harbour, we anchored at 8 o'clock on the morning of the 27th of September.

At this place we took ballast and filled up the bunkers with coal from the hold.

On our return here, as at the other stations, we found all in good health and spirits, liking the work, and well satisfied with all that had been provided for them. The provisions, especially the evaporated fruits and vegetables were spoken of as being of an excellent quality.

We continued the homeward voyage from Port Burwell at 3 p.m., on 29th September, carrying the ebb tide with us through Grey Strait for Nachvak Bay.

At noon of the 30th we anchored in a cove on the north side of the entrance to the bay, and having selected a site for the house, proceeded at once with its erection and with the work of landing the stores.

On Saturday evening, the 4th October, the work was completed, but as it had been a week of unusually hard work for all hands, I lay in harbour till daylight on Monday morning, the 6th, when we proceeded to sea for St. Johns, Newfoundland, where we arrived on the morning of Saturday, the 11th, and having delivered the ship up to the owners, Messrs. Job Bros. & Co., I took passage for the entire party in steamship "City of Mexico," sailing that day for Halifax.

Navigation.

The ice has been supposed, hitherto, to be the most formidable barrier to the navigation of the straits, but its terror disappears, to a great extent, under investigation. The ice met with on the cruise of the "Neptune" may be divided into three classes—having distinctly separate origins. They are: icebergs from the glaciers of Fox Channel; heavy arctic field ice from the channel itself, and what may be called ordinary field ice, being that which had been formed on the shores of the bay and straits.

We met no icebergs in Hudson's Bay, nor did I hear of any being seen there. In the straits a good many were seen, principally along the north shore, where many of them were stranded in the coves, and some were met with in mid-channel. Of those seen in the eastern end of the straits, some had undoubtedly come in from Davis' Straits, passing between Resolution Island and East Bluff; but all of those met to the westward had come from Fox Channel, as observations made by Mr. Ashe, at North Bluff, show, that an iceberg coming in sight from the westward will pass out of view to the eastward in from three to four tides, showing an easterly set of upwards of ten miles a day. The icebergs seen in Hudson's Straits, in August and September, would form no greater barriers to navigation than do those met with off the Straits of Belle Isle, nor were they more numerous in Hudson's Straits than they frequently are off Belle Isle.

The ordinary field ice was met with off North Bluff and the Upper Savages, on the 11th of August. This ice, though it would have compelled an ordinary iron steamer to go dead slow, gave no trouble to the "Neptune," the mate on watch running the ship at full speed through between the pans, rarely touching one of them. Just before entering Ashe's Inlet we had to break through a heavy string, which was, however, done without in the slightest degree injuring the ship. In the harbour (Ashe Inlet) the ice came in, with the flood tide, and set so fast that the Eskimo were able to walk off to the ship, a distance of three-quarters of a mile. On the south shore our experience was much the same, but no ice was met with through which the ship could not have forced her way without damage. In the centre of the straits, to the east of North Bluff, no field ice was seen at all, and after leaving Stupart's Bay, on the outward voyage, although the vessel lay-to for the night in the ice, it was only to wait for daylight, and not because the ice was too heavy. This pack extended about eighteen miles out into the straits, and after getting over this distance we came into clear water. From this point to Charles Island, and thence to the end of Salisbury Island, long strings of ice were frequently seen, but as their direction was invariably parallel to our course, or nearly so, we coasted round them. On the homeward voyage none of this field ice was seen. The Eskimo, both at Ashe

Inlet and Stupart's Bay, informed me that there was an unusually great quantity of ice in the straits this year, and that they had never seen the ice hang to the shores so late in the season.

The Heavy Arctic Ice.—After passing the east end of Salisbury Island the ice got heavier and closer, and when off Nottingham Island the pack was so run together that I determined to give up the attempt to force the ship through it, and working out again, headed more to the southward. In making in for the land here we broke the propeller, but succeeded in taking the ship into harbour with the stumps.

Viewed from the top of a hill on Nottingham Island the sea in every direction was one vast ice field, and to the southward, between South-east Point and Cape Digges, we saw four vessels fast. This ice was altogether of a different type to what we had hitherto met with. Some of it was over 40 feet thick of solid blue ice, not field ice, which had been thickened by piling of pan on pan, but a solid sheet of ice which had evidently been frozen just as we saw it. Much of it was 20 feet thick, and for the general average of all the field we passed through coming into harbour, I estimate that the thickness would have been upwards of 15 feet. The question as to the origin of this ice and whether it will be frequently met with in the west end of the Straits is an important one; for in such ice, when closely packed, a vessel even of the build and power of the "Neptune," was perfectly helpless. I do not consider that it is possible for ice to form in Fox channel to a greater thickness than 10 feet in a single year, and I feel convinced that much of the ice which we encountered was the accumulation of several years.

The depth to which water will freeze has, so far as I know, never yet been determined, but it is certain that ice being a very poor conductor of heat, when once a certain thickness of ice has been formed, the rate of thickening will be very slow. In regard to this point, measurements of the formation of ice will be made at some of the observing stations in Hudson's Straits this year, which will assist in finally determining this question.

If, as seems probable from the reports of the Hudson's Bay ships, this year and last year have been exceptionally heavy ice years, it is reasonable to conclude that only occasionally does this heavy Fox Channel ice appear in Hudson's Straits. Another piece of confirmatory evidence as to the exceptional nature of the ice met with in the northern part of the Bay this year is the statement in Capt. Fisher's letter, found at Marble Island and quoted in the narrative portion of my report, that he had been unable to reach, up to the date of his letter, the east shore, or to go up the Welcome on account of the ice.

The harbour ice forms at Churchill on the average about the middle of November and breaks up about the middle of June. As this is the only known harbour on the west coast of the bay, these times may be taken as marking the extreme limits of the season during which it would be possible for a ship to enter and leave the harbour.

It is only fair to state, that had I been making the passage from Cape Chudleigh, direct to Churchill instead of coasting and working across the straits, I do not consider that I should have been delayed by ice, more than forty-eight hours: but no ordinary iron steamship, built as the modern freight carrier is, could have got through the heavier ice that we met without incurring serious risk, if not actual disaster.

Since the foregoing was written, I have received a copy of the Report of Lieut. Ray, United States Signal Service, to the Chief Signal Officer, on the conduct of the observations at Point Barrow in the Arctic. He gives as the greatest thickness of ice formed in one season 6 feet 2 inches. At Point Barrow the formation of ice on the shore is certainly influenced by the passage of a current of warm water passing through Behring Straits and setting north-east.

Fox Channel has no such advantage, and I still think it possible that a sheet of ice 10 feet in thickness might be formed there in one season.

The Compass.—In working through the straits, especially at the western end, I found the ordinary compass so sluggish as to be almost useless. The Sir Wm. Thomson card, however, worked admirably when properly compensated.

The reason of the difficulty with the compass is, that from the proximity to the magnetic pole the horizontal directive force of the earth's magnetism, which alone directly affects the compass needle, is very small compared with the whole magnetic force; consequently, the effect of induced magnetism in the iron of the ship on the compass becomes very large in comparison with the direct action above mentioned; the result being, that in an imperfectly compensated compass the error due to local attraction is very greatly increased.

The means of correcting this error in the Sir Wm. Thomson binnacle are perfect and easily mastered, and the system is such that the compass can, after the first voyage or two, be perfectly compensated by using certain proportions of soft iron bars and magnets, as correctors, the proportion having to be determined by actual observation and experiment on the voyage.

All steamships making the voyage through the straits should have one of these compasses as a standard, and the captains should familiarize themselves with the methods of correcting them, and as often as opportunity offers take azimuth observations, both stellar and solar.

Currents.

Off the entrance of Hudson's Strait I found the current setting to the southward, During the two days whilst lying off in fog, the wind was very light, and the drift of the ship must have been almost entirely due to the current. In the forty-eight hours lying-to, the ship was set forty miles to the south of her position by dead reckoning. This is a somewhat greater amount of southerly set than the Admiralty directions indicate, and ships approaching the entrance of the straits would, in thick weather, have to do so with great caution.

At Port Burwell, near Cape Chudleigh, the tide rises and falls, at springs, about 19 feet, and the current in Grey Strait, between the Button Islands and the cape, flows at the rate of about four knots an hour; and when a strong breeze is blowing against the tide, a very nasty and confused and breaking sea gets up, which fishing schooners might find dangerous.

At Ashe's Inlet, near North Bluff, the tide rises and falls 32 feet at springs. There is a tide-race off the Bluff, and within three miles of the shore the velocity of the tide currents is very great, sometimes reaching six knots.

At Stupart's Bay, near Prince of Wales Foreland, the rise and fall of the tide is 28 feet. The tides of this coast do not show as high velocities as on the north side, probably owing to the water being shoaler.

At the western end of the straits the tides also run with great velocity. The rise and fall at Nottingham Island, at spring tides, is 14 feet, and Cape Digges about 10 feet.

At the entrance of Port Churchill there is a tide-race, the velocity of which, at half-tide, I estimate at seven knots.

Meteorological.

The meteorological work, which is to be done at the stations, is as follows:—

Observations will be taken six times a day, of height of barometer, temperature of the air, temperature of wet bulb thermometer, velocity and direction of the wind, reading of hair hygrometer, cloudiness, with record of amount and kind of cloud, and direction of its movement, and rain and snow fall. Water temperatures will also be taken. The times of observation are at equal intervals of four hours, and so selected that three of them are synchronous with the regular telegraphic series taken by the observers of the Meteorological Service.

Complete observations were taken on board during the voyage and, for the purpose of illustrating the weather which was met with in Hudson's Straits, I shall compare it with that experienced at Belle Isle, a station of the Meteorological Service, and in the regular trade route between Quebec and Europe.

For the first period from 1st to 31st August.—The “Neptuno” was, on 1st August, at Nachvak Bay, within 100 miles of the east end of the Straits and, on 30th August, had just left Nottingham Island on the west end, so that the month of August was spent in the straits region.

The following table is compiled from the Meteorological Records:—

	Belle Isle Straits.	Hudson's Straits.
Number of days on which fog is recorded.....	13	9
Approximate number of hours of fog.....	220	102
Days on which snow fell.....	0	4
Days on which rain fell.....	10	8
Days on which wind exceeded 25 miles per hour, but did not reach 40.....	6	5
Days on which wind exceeded 40 miles.....	2	1

The month of August thus shows favourably for Hudson's Straits, the fog there being reported on six days only, as against thirteen days in Belle Isle; and the total number of hours of fog being respectively 102 in Hudson's Straits, and Belle Isle, 220; and if the duration of the snow storms in Hudson's Straits, nineteen hours, be added to the number of hours of fog, it still shows favourably. The number of gales also is six at Belle Isle for five in the straits; and of heavy gales, two at Belle Isle, and only one in the straits.

The following comparison for September is between Station No. 1, at Cape Chudleigh and Belle Isle:—

	Belle Isle Straits.	Hudson's Straits.
Number of days on which fog is recorded.....	7	4
Approximate number of hours of fog.....	82	34
Days on which snow fell.....	3	8
Days on which rain fell.....	15	6
Days on which velocity of wind was between 25 and 40 miles per hour.....	4	5
Days on which velocity of wind was 40 miles or over per hour.....	11	3

Days on which any snow fell are put down as snow days, though rain as well as snow may have fallen on those days.

In the character of the weather, therefore, for the two months (August and September) so far as it affects navigation, Hudson's Straits compare favourably with the Straits of Belle Isle, there being eleven heavy gales at Belle Isle against three in Hudson's Straits, and more than double the amount of fog.

The mean temperature of the month at Cape Chudleigh for August was 39°; for Belle Isle, 49° 67; and for September, Cape Chudleigh, 32° 76; Belle Isle, 43° 1.

Reports formerly received from the Labrador Mission Stations give higher mean temperature for those months, but those stations may be considered as almost inland stations in the character of their weather, and would thus show both higher temperature in summer and lower in winter than an insular station like Belle Isle.

I have received, through the courtesy of the Chief Signal Officer of the United States Signal Service, copies of the observations taken at Fort Chimo, in Ungava Bay, by Mr. Lucien Turner, who has spent two years there, and the winter temperatures given in these will not, I think, greatly differ from those in the Straits.

These tables form Appendix B to this report.

The following table gives the weather experienced in Hudson's Bay, from the 1st to 16th September:—

Cape Digges and Marble Island.

		Mean temperature.
September	1.—Fair weather, light N.E. winds.....	43°
“	2.—Fine and cloudy p.m. with strong N.E. wind	42°
“	3.—Rainy weather, moderate gale from S.E.....	40°

Off Churchill.

September	4.—Rainy weather, strong gale, from N.W.....	40°
"	5.—Cloudy weather, strong gale from N.W.....	40°
"	6.—Cloudy, light rain, light N.W. wind, thick weather.....	39 5°

At Churchill.

September	7.—Fine weather, light S.W. wind.....	42°
"	8.—Fine weather, light N.W. and S.W. wind.....	44°
"	9.—Fair cloudy weather, moderate N.E. wind...	41°

York.

September	10.—Cloudy weather, light rain, mod. S.E. wind..	40°
"	11.—Fair weather, moderate N.E. wind.....	41°
"	12.—Fair weather, light S. wind.....	46°

York to Digges.

September	13.—Fair weather, light N.E. wind.....	42°
"	14.—Fog in a.m., fine p.m., light N.E. wind.....	35°
"	15.—Foggy weather, strong N.W. wind.....	34°
"	16.—Fair weather, light N.E. wind.....	32°

The above shows one gale lasting nearly three days, viz., the 3rd, 4th and 5th, and two days on which fog occurred. On the 14th the fog lasted from 9 a.m. to nearly 3 p.m., closing down again early on the morning of the 15th and continuing thick fog till about 3 p.m.

Sea Temperatures.

The temperature of the surface water off Belle Isle on 25th July was 41·6 which gradually decreased as we proceeded northward to 34·7 on 4th August, off the entrance to Hudson's Straits.

On the homeward voyage these temperatures were, off Hudson's Straits 32·5 on 29th September, and abreast of Belle Isle, but some distance to the eastward, 36° on 9th October.

In Hudson's Straits, the mean surface temperature, as obtained from observations taken when the ship was at sea, was, on the west-bound voyage, found to be 32·9, the highest mean of a day's observations was 33·3, and the lowest 32·6. On the homeward voyage the lowest daily mean was 31·8 and the highest 33°. The highest temperatures were in each case observed at the eastern end of the straits and the lowest off Nottingham Island.

In the bay the surface temperatures varied much with the geographical positions, being 39·4 off Marble Island, 41° off Cape Churchill, 39·7 about 100 miles north-east of York Factory, observed whilst steaming across to Cape Digges, and 36° off the south end of Mansfield Island.

Hudson's Bay may therefore be regarded as a vast basin of comparatively warm water, the effect of which must be to considerably ameliorate the winter climate to the south and east of it.

The resident factor at Churchill informs me that the bay never freezes over so far out from shore, but that clear water can be seen; and as the temperature of the water must be above 29·8 Faht. (the freezing point of salt water) when at the same time the temperature on shore is below zero, we have a set of conditions which will cause a regular area of low barometric pressure to remain over the bay during the winter, with prevailing west and north-west winds and very cold weather on the west and north west of the bay, as shown by observations at York Factory; whilst on the opposite side of the bay winds from south-west, south and south-east would prevail.

In concluding this the meteorological portion of the report, I would point out that so far as meteorological conditions are concerned, the bay has been proved navigable early in June. The barque "George and Mary" sawed out on the 7th June of this year, and was cruising under sail from that date onwards in the northern part of the bay.

Surveying Work.

At Station No. 1, Port Burwell, near Cape Chudleigh, the harbour and part of the adjacent coast was surveyed by Mr. W. A. Ashe, D.L.S., who was one of the observers appointed to the expedition, and I have prepared sailing directions for entering the port. Mr. Ashe also surveyed the harbour at Station No. 3 (Ashe Inlet). At all the other stations in the straits I have myself, besides making determinations of position, variation and dip, made surveys of the harbours, and written out the necessary sailing directions for entering the ports. I also made a hurried survey of the harbour at Marble Island, and have obtained a copy of a plan of Churchill Harbour from one of the Hudson's Bay Company's officers. Copies of all these I will furnish you with hereafter, when I have had time to complete the final reductions and recopy the plans.

Resources of the Region of Hudson's Bay and Strait.

As to the resources of these waters, I have the honor to report:

1. That the economic fish and mammals of those waters are the whale, porpoise, walrus, narwhal, seal, salmon, trout, cod, and a variety of small fish.
2. That the only fishing industries developed so far are, the whale fishery by the Americans, and the porpoise, walrus, salmon and trout fisheries by the Hudson's Bay Company.

3. That the chief whaling ground is the Rowe's Welcome, a vast basin in the north-western portion of Hudson's Bay. Here the American whalers, chiefly from Massachusetts and Connecticut have been conducting a very profitable fishery for more than a quarter of a century, and are still in active operations.

The report of the United States Commissioners of Fish and Fisheries for 1875-6 states, that during the eleven years preceding 1874, about fifty voyages were known to have been made by whaling vessels from New England to Hudson's Bay, and their returns amounted to at least \$1,371,000, an average of \$27,420 per voyage, which, as most of the vessels engaged in the trade are comparatively small sailing vessels, shows a large margin for profit to those engaged in the business. And if we allow an average of three vessels per annum since the date of the returns up to the present year, we have \$822,600, as the value of the oil and bone taken by our neighbours from the waters of Hudson's Bay since the date of the report above quoted, making a grand total of \$2,193,600.

The wintering quarters of these whalers is at Marble Island, on the north-western coast of Hudson's Bay. The whaling ships, generally, leave Massachusetts or Connecticut in July, and reach the island some time in September, where they winter in a well sheltered harbour, and saw out of the ice in June of the following spring. They then press northward as fast as the moving ice will permit, until the whaling ground is reached, where they fish until the 1st September, and then sail for home, with their ships well loaded with blubber and bone. One or two whaling vessels, and occasionally more, winter at Marble Island each year.

Although this industry is, as yet, comparatively small, I am persuaded that, from the large profits realized by those engaged in it, from the ample opportunities for its extension, and the increased attention which is now being given to the resources of the Hudson's Bay region, a much larger number of vessels will, undoubtedly, be drawn into it at an early day. I am satisfied that there are large numbers of whales in these waters, from the fact that we met with them continually during the cruise of the "Neptune," and because, so far as I can learn, those engaged in the catch have never yet been compelled to return without a fair cargo. The bark "George and Mary," Capt. Fisher, of Connecticut, wintered at the Island last season, sawed

out of the ice on the 7th of last June, and succeeded in taking three whales in the open waters of Hudson's Bay before reaching the "Welcome." Considering that five or six of these mammals would complete her cargo, it is easy to see that this fishery is by no means falling off.

4. Of the fisheries carried on by the Hudson's Bay Company, that of the porpoise is the most extensive. The blubber of these mammals weighs from 250 to 400 pounds, and is very rich in the finest of oil.

Last year the company secured nearly 200 in one tide at Churchill, and a much larger number at Ungava Bay. They have established extensive refineries at several of their northern stations, and instead of exporting the blubber in bulk, as formerly, refine it, shipping the pure oil in casks. The porpoises are not shot or harpooned, as is the case with the walrus and whale, but are grounded on the flats in coves, where the tide rises 10 or 15 feet or more, and where, by means of trap nets, they are held in check until the water recedes, leaving them high and dry on the boulders and sand. The process is very simple and inexpensive. The company also carry on a walrus hunt, sending two sloops annually from Churchill to two very productive walrus grounds, north of Marble Island, where they have never failed to secure as much blubber, ivory and hides as their little vessels will carry in a few weeks. They took between twenty and thirty of those animals the present season. On this trip they also meet the northern Eskimo, and carry on a very valuable trade with them, exchanging powder, shot, &c., for ivory, oil, musk ox robes, and other furs.

One of the members of the expedition was furnished with an estimate of the value of the oil secured in the Hudson's Bay region last year by the company and the American whalers, which, although I had no means of verifying it, is probably within the mark. It places the value of the export at \$150,000. I am satisfied that the walrus and porpoise fisheries may be developed to almost any extent; and as increased attention is sure now to be given to this industry, we may rely upon its almost immediate extension. We met with walrus in great numbers at the western end of the strait. In one afternoon, while steaming from the Digges Islands to Nottingham Island, we found between fifty and a hundred of them on the ice.

5. The company is also engaged at several points, particularly at Ungava, in the salmon and trout fisheries. These excellent fish abound in vast quantities in nearly all the streams, and are generally most plentiful at certain seasons just above and near the head of tide, where the salt and fresh waters mingle. From what I could learn of this industry, I conclude that it is but the beginning of what will, in the near future, become an extensive and profitable business.

At the present time the Hudson's Bay Company have a steamer, called the "Diana," which goes from London to Ungava Bay direct. She is fitted out with refrigerating apparatus, by means of which they are enabled to send home the salmon fresh to the London market, where it realizes high prices, and has, I understand, proved a profitable business for the company. Cargo this year is reported to have realized \$18,000. This is the sole business that this little steamer is engaged in, as another steamer, called the "Labrador," carries all the freight required for Fort Chimo and the Ungava district.

6. Cod-fish. Up to the present time cod have never been found in the waters of Hudson's Bay or the western portion of the strait, but they are very plentiful in the bays round Cape Chudleigh, on both the east and west side. Newfoundland schooners, even now, work as far north as Nachvak Bay, and seem, year by year, to have been going further north.

The quality of cod found off Cape Chudleigh, though good, was not of the same high quality as that got on the banks.

7. In conclusion, I have the honour to urge that in any negotiations with the Government of the United States, relative to a treaty of reciprocal trade, due allowance should be made for the great value of the fisheries of Hudson's Bay.

If American whalers are to be permitted to continue to fish in those waters, arrangements should be made by which Canada would receive a substantial equivalent for the privilege.

I would further suggest that unless a very large consideration is granted in return for the privilege, the Canadian Government should reserve the right to make and enforce such regulations as will prevent the extermination of these valuable mammals from our northern waters. In support of this suggestion, I would call your attention to the fact that some years ago whale fishing was a thriving industry in the Gulf of St. Lawrence, some ten schooners being at one time engaged in it, but that shortly after the Americans were granted the right to fish in these waters, they had, by use of explosive bombs and other methods of capturing these animals, completely driven them out of the gulf, and the Canadian whaling business was destroyed.

Trade.

The trading station for the south side of Hudson's Straits is Fort Chimo, at the south end of Ungava Bay, and the Eskimo and Indians visit the fort regularly, to exchange their furs for powder, shot, &c.

At Nachvak Bay also, the company maintain a post, where a number of the most valuable furs, the black fox, &c., have been obtained from the natives.

The Nachvak station is one of the company's chain of posts on the Labrador coast, subsidiary to Rigoulette. These posts obtain their supplies by the steamer "Labrador," and I have been informed that the Newfoundland authorities claim and collect Customs duties on the whole ship's invoice at Rigoulette, thus collecting there duties on goods which are destined for consumption in Canada, inasmuch as all the goods for Fort Chimo are included. Canada is thus the loser, whilst the company derives no benefit, except what may arise from the difference of the tariffs of the two countries.

The exports from these and the Mission stations are principally, seal skins and oil, salted salmon and trout, codfish, ivory, bear, deer and fox skins. From Ungava, besides fur, porpoise oil is exported, and frozen salmon, as stated previously.

The Hudson's Bay Company, in trading, have to pay duties, and a considerable sum accrues to the Canadian Government in Customs dues on the importations to Churchill, York and Moose. Every American whaler, however, which enters the bay, is an unlicensed trader, carrying in American goods and trading with the natives in the north-west of the bay, where they compete with the Hudson's Bay Company, who have to pay duty on their importations.

A regular trading post has also been established by a Capt. Spicer, an American citizen, on the north shore of the straits, a little to the west of North Bluff, which I intended visiting, but was unable to do so.

I was, however, informed by the natives, that each year a ship went to the station, that an agent lived there through the winter, and that about fifty families traded with him. The Eskimo at North Bluff had an old whale boat of American build, but in good repair, and they informed me that they occasionally killed whales for Capt. Spicer, and that whenever they secured a whale that they were given spirits. The evil effects of such payment are too well known to need comment.

In reference to the value of the trade, I have heard it estimated, by men whom I considered competent judges, that a good Eskimo family would be worth \$500 a year to a trader. The Hudson's Bay Company rate some of their best Indian hunters as worth \$1,000 a year to the company, and, allowing that the straits region is a somewhat poorer region than the north-west of the bay, a family ought still to be worth nearly \$400 to a trader. This estimate gives the value of Capt. Spicer's station at \$20,000 a year, an estimate which I believe to be rather below than above the truth. All goods, destined for trade with the natives, on board of the American whalers, should be chargeable with duty, or a license fee charged them, before they are permitted to enter Hudson's Straits, which would be sufficient to cover the duty, so that they may be placed on the same footing as the Hudson's Bay Company; for the value of the trade in musk ox robes, cariboo robes, seal skins and ivory, forms no unimportant part of the profit of the whaling voyage.

The use of ardent spirits as an article of trade, or indeed its importation, should be absolutely prohibited.

There is room for the profitable establishment of trading posts on the south shore of the bay, as the natives there have to go upwards of 300 miles, to Fort Chimo, for powder, shot, &c.

I was also informed by the natives at North Bluff, that about the Middle Savage Islands we would find natives who had never traded with white men, and who had large quantities of ivory.

That a profitable business can be carried on in pursuit of whale and porpoise fishery and walrus hunting, together with the trade with the Eskimo, seems beyond doubt, and it is unfortunate that none of the profits derived from it are at present received by Canadians.

NATURAL HISTORY.

The Inhabitants.

With the exception of people who may be in charge of Capt. Spicers' station, the only inhabitants of the straits and northern part of the bay are the Eskimo.

On the north side of the Straits they are quite familiar with the ways of white men, and seem to be much pleased at the prospects of increased intercourse with them. Some one or two of them speak English, whilst some others understand easily what is said to them, but refuse to speak it. They are particularly fond of any article of clothing, either cotton or woollen, and the head man at North Bluff was arrayed in all the glory of a stand-up linen collar.

These natives are docile, amiable and willing to work. When landing the stores and coal at North Bluff they worked all day along with our men, carrying heavy weights up over the rocks, and working as cheerily and heartily as could be desired, taking their pay in biscuit, of which they are inordinately fond.

The number met with at the station here was about thirty, but during my absence a large number of them visited the station, maintaining the most friendly relations with our party.

They have no farinaceous food of any kind, and, as a consequence, the mothers suckle the children till they are from three to four years of age. The families are small, there rarely being more than two or three children, and although early marriages are the rule among them, I cannot help thinking that their numbers have sensibly diminished, inasmuch as we found signs of their presence everywhere; yet, except at Port Burwell, Ashe Inlet and Stupart's Bay, none were met with. About six miles south of Port Burwell there is the remains of what must once have been a large Eskimo settlement, their subterranean dwellings being still in a fair state of preservation. At the present time, so far as I can learn, there are only some five or six Eskimo families between Cape Chudleigh and Nachvak.

Along the Labrador coast the Eskimo gather in small settlements round the Moravian Mission stations. At these places their numbers vary considerably. Nain is reputed to be the largest settlement and its Eskimo population amounts to about 200 souls.

These are all educated. They can read and write in their own language and the missionaries informed me that they were regular attendants at church and are very fond of music. No alcoholic or other liquors are given to the natives by these missionary traders; but they occasionally procure small quantities from Newfoundland fishermen. It is, however, a rare occurrence, and there is no record of any disturbance or trouble ever having been caused.

These missions are self-supporting, the missionaries supplying the Eskimo on loan with the very best traps, fishing lines etc., and purchasing from them all their produce, whether it be seals, cod, salmon, furs or anything else. They are supplied by a sailing vessel called the "Harmony," which sails from London each year, visits all their Mission stations and then returns, taking with her the great portion of the season's catch. The Newfoundland mail steamer makes several trips to Nain during the summer of each year, but does not go any further north.

I have mentioned these missionary traders and their work, because I am of opinion that the system, when honourably carried out, as it has been and is on the Labrador Coast, is the one which best meets the wants of the natives and tends to the improvement of their condition.

In speaking of the inhabitants of the straits, I mentioned more particularly those living on the northern side, but those met with at Stupart's Bay were equally tractable and ready to assist in the work. They were, however, from less frequently meeting with white people more simple, but decidedly more demonstrative; their delight on being informed that we were going to build a station and leave a party among them was exhibited by their forming a circle round the interpreter and dancing and shouting like a lot of school children.

One word must be said in regard to their honesty. Although scraps of iron and wood possess a value to them which we can hardly appreciate, they would take nothing without first asking permission; not even a chip or a broken nail was taken without their first coming to the officer who was on duty at the building for permission to take it.

As to the pernicious effects of their contact with American whalers, I beg to quote from the report of Lieut. Ray, of the United States Signal Service, who was in charge of the Observatory at Point Barrow, premising that I have every reason to believe that the New England whalers carry on very much the same sort of trade that their brethren of the Pacific seem to have done. Lieut. Ray says:—

"The safety of the station would be very much increased if the law relating to the sale of contraband goods by the whale men and traders on this coast could be enforced." * * * * * "I believe the offenders in the fleet this year are confined to two or three ships. I met nearly all the captains when they first came up, and they promised a strict compliance with the law, but in spite of all that, the natives here have been drunk three different times during the last month."

Fauna.

The terrestrial mammalia of Hudson's Straits and northern part of the bay are: The polar bear, the fox (three varieties), the hare, the reindeer.

The skin of the polar bear is valuable, being held at \$12 by the agents of the Hudson's Bay Company. These animals, though reported by the Eskimo to be very savage, will not, I think, as a rule, attack a man unless first wounded or emboldened by hunger, when I can well understand that they would be dangerous to encounter. They prey chiefly on the seal. The Eskimo on the south side of the straits, at Stupart's Bay, informed me that at certain times of the year there were large numbers of them in that vicinity. The meat of these bears is not unpalatable, but the liver is said to be poisonous.

The Fox.—Judging from the number of white fox skins which the natives had, these animals must be very numerous. These skins, however, have no high commercial value, and are, indeed, almost valueless, unless captured at a certain season of the year.

The blue fox is a sort of a steel grey colour. Their skins are more valuable than those of the white fox, but they are much less numerous.

The red fox is valuable as indicating the probability of the presence of the black fox, whose fur is so very valuable. The red fox was seen on the south side of the strait, and black foxes are annually shot or trapped in the country south of Cape Chudleigh.

The reindeer are the food and clothing of the Eskimo, and their horns are used for making the spring bows of their fish spears and for many other purposes. We procured some of the venison from the Eskimo at North Bluff, which was pronounced by every one to be excellent.

The hare is a common animal over the whole coast of the straits, being especially numerous about North Bluff.

Game Birds.—Many kinds were seen. Geese, swans, duck and ptarmigan were plentiful, so that the officers and men at the station can easily procure a palatable change of diet.

The Work of the Expedition in the Coming Year.

Much will undoubtedly be learned from the observations taken during this winter as to the formation and breaking up of the ice and generally in regard to its movement, and also of the phenomena affecting navigation, but it would be impossible to state definitively from one year's observations what was the average period of navigability of the straits. I consider, therefore, that it would be desirable to continue certain of the stations for a second year, and might perhaps be desirable to keep on three of them for a third year.

For the year 1885-86, I have the honour to recommend that the following stations, Port Burwell, near Cape Chudleigh, Ashe Inlet, near North Bluff, Stupart's Bay, near Prince of Wales Foreland, Nottingham Island and Digges Island, be continued.

The station at Nachvak Bay could easily be disposed of, as the Newfoundland fishermen already visit the place for the cod fishing, and if it were advertised in the St. Johns, Nfld., papers, I do not doubt that the Department would get offers for the purchase of the house.

The expedition for next year should be ready to start from Halifax about the 15th of May—not later than this date—and arriving off Hudson's Straits about the 1st of June, if possible visit and relieve the stations. Should the ice prevent our getting on shore, the ship should push on so as to investigate once for all the condition of the ice in the straits and bay in the early part of the season. If successful in getting through the straits, the voyage should be continued to Fort Churchill, the endeavour being made to arrive there about the opening of navigation, the 15th of June.

After leaving Churchill the eastern shores of the bay should be visited, and a running survey made of such portions of the coast as practicable. Beacons should be erected on the north end of Mansfield Island and the south end of Southampton Island. Both these islands are low-lying, with shoal water running for some distance out; they are of a dark grey limestone formation and most difficult to make out at night, the mariner's only safety being in the constant use of the lead. Especially are they dangerous on account of the tides, which run along the east coast of Mansfield Island at the rate of about four knots per hour.

This work could, I think, be accomplished and the ship be back in the straits by the 15th August. The remainder of the time should be devoted to making a running survey of such part of the coast of the straits as may be possible. Capt. Spicers' station should be called at, and if time permitted, the Hudson's Bay post at Ungava should also be visited, the expedition returning to Canada in October.

If, however, the Government regard it as more important to investigate the fisheries of the bay and straits, the ship should push up north for Marble Island as soon as possible, thence to "The Rowe's Welcome." After spending a short time in "The Welcome," the porpoise fishery at Churchill should be examined.

After leaving Churchill, under any circumstances, the east shore should be visited, and its mineral and other resources examined and reported on.

The vessel should also be fitted with a deep-sea dredging apparatus, wire dredge rope and deep-sea sounding apparatus.

In the event of your deciding on sending out the expedition in May, it would be advisable to send to Ashe Inlet a schooner load of coal. If this vessel were to start so as to be in Ashe Inlet about 20th August, she would have but little difficulty from the ice. The harbour is an easy one to make, with no outlying shoals or rocks; inside it is well sheltered and good holding ground.

I have endeavoured in the foregoing pages to give all the information in my power in regard, not only to the navigation, but to the resources of the region of Hudson's Bay and Straits, and I trust that my efforts will meet with your approval.

All of which is respectfully submitted.

ANDREW R. GORDON,
Commanding Hudson's Bay Expedition.

APPENDIX A.

GEOLOGICAL AND NATURAL HISTORY SURVEY,
MUSEUM AND OFFICE, SUSSEX ST.,
OTTAWA, 19th January, 1885,

The Honorable A. W. McLELAN,
Minister of Marine and Fisheries,
Ottawa.

SIR,—In compliance with instructions received from the Hon. Sir David Macpherson, Minister of the Interior, I have the honor to transmit to you, as received by me on the 14th inst., the accompanying copy of the report, by Dr. Bell, of observations made on the shores of Labrador, Hudson Strait and Bay during the voyage of the steamship "Neptune," from the 22nd July to the 11th of November, 1884.

The botanical and marine zoological collections made during the voyage have been examined. The plants have been named by Professor Macoun, the crustaceans by Professor S. J. Smith, of Yale College, and the molluscs and echinoderms by Mr. J. F. Whiteaves. The plants are represented by 118 genera and 227 species. The crustacea by 13 genera and 16 species. The molluscs by 19 genera and 25 species, and the echinoderms by 5 genera and 6 species. The brachiopods, cirripeds or barnacles and the annelids each by 1 species.

Of the plants Professor Macoun states as follows :—

"The collection is a very interesting one and shows conclusively the Arctic character of the climate of the Straits and that part of Labrador north of Nachvak. North of Nain, all the plants obtained are exclusively Arctic, not one of them, except the Arctic Raspberry (*rubus chamaemorus*) and a couple of species of *Vaccinium* ranging as far south as the Gulf of St. Lawrence. The greater number, however, are widely distributed on the shores of the Arctic Sea, and are the characteristic plants of both Arctic Europe and America."

Mr. Whiteaves states that the marine invertebrata are well known Arctic species, most of which are common to the St. Lawrence Gulf, their range there being from about ten fathoms to fifty, where they form a large part of the food of the codfish—especial thanks are due to Professor Smith, of Yale, for the list of the crustacea.

I have the honor to be, Sir,
Your obedient servant,

ALFRED R. C. SELWYN.

OTTAWA, 24th November, 1884.

A. R. C. SELWYN, Esq., LL. D., F. R. S.

SIR,—Herewith I beg to submit my report as geologist and naturalist on the Hudson's Bay Expedition, sent out by the Government of Canada during the present season.

I have the honor to be, Sir,
Your obedient servant,
(Signed) ROBERT BELL.

OBSERVATIONS ON THE GEOLOGY, MINERALOGY, ZOOLOGY, AND BOTANY OF THE
LABRADOR COAST, HUDSON'S STRAIT AND BAY.

BY ROBERT BELL, M.D., LL.D., B.A.Sc., F.R.S., CANADA, ASSISTANT DIRECTOR
OF THE GEOLOGICAL SURVEY.

Medical Officer to the Expedition.

The question of sending a party by sea into Hudson's Bay, for scientific purposes, at the expense of the Government, has been before the public of Canada for some years. Without entering into the subject of the various useful purposes which it was believed such a party might accomplish, it may be stated that the main object of the expedition, sent out by steamship the present season, was to establish six observatory stations on the shores of Hudson's Strait. The parties to be left in charge of these stations were to remain one year and to keep regular meteorological records, and to note all seasonal events, especially with regard to the condition of the Strait itself in winter, the tidal phenomena, &c., all with a view to throw additional light on questions regarding the navigation of these waters. If time permitted, after having built the stations, the vessel was to visit certain parts of Hudson's Bay. Without interfering with the above mentioned objects, the expedition would afford an opportunity for obtaining much desirable information in regard to the geology and mineralogy and the zoology and botany of the places which might be visited. The writer, who had been on Hudson's Bay in previous years, and who had already passed through the Strait (see Report of the Geological Survey for 1880), was selected for this duty, and also to act as medical officer to the expedition. I also acted as taxidermist and photographer for geological purposes, and provided myself with the instruments necessary for various methods of surveying, in case opportunities for using them should occur.

The expedition was essentially a meteorological one, and Lieut. A. R. Gordon, R.N., of this branch of the public service, was selected for the command; and the general management fell within the province of the Department of Marine. Notwithstanding that I had neither men nor boat at my command, I managed, while the stations were being built, or while the ship was taking in ballast, to get ashore with the boats that were passing backward and forward between the vessel and the land, and in some cases I had the use of a boat and the assistance of officers and men, both of the expedition and of the ship's company.

The following letter from the Deputy Minister of Marine, in reply to one from Dr. Selwyn, will best explain my position with regard to the facilities to be expected :

“ DEPARTMENT OF MARINE AND FISHERIES,

“ Ottawa, 20th June, 1884.

“ SIR,—I have to acknowledge receipt of your letter of the 18th instant, making certain enquiries in regard to the Hudson's Bay Expedition and the employment of Dr. Bell, and in reply I am to inform you that the vessel will sail from Halifax about the 21st of next month. Nothing beyond board and berth accommodation can be given Dr. Bell, the vessel being chartered to the Department, and no special accommodation being guaranteed, but space will doubtless be provided sufficient for the storage of any specimens, &c., which Dr. Bell may collect or the stores provided for the preservation of the same. With reference to your enquiry as to what assistance, as regards men and boats, can be provided for Dr. Bell's work, I have to inform you that Dr. Bell will have the opportunity of landing at every place at which the vessel

may call, and every facility will be given him which the officer in charge may consider he is able to afford without prejudicing the primary objects of the Expedition, but no special boat or crew can be furnished for Dr. Bell's use. I am also to inform you that it is the intention that the vessel shall return this fall, but it is impossible to state positively that she will. I am also to state that no charge will be made for Dr Bell's maintenance while on board the vessel.

"I am, Sir,

"Your most obedient servant,

"W. SMITH,

"Deputy Minister of Marine, &c."

A. R. C. SELWYN, Esq., LL.D., F.R.S.,

Director Geological and Natural History Survey.

The route followed by the expedition, in going out and returning home, together with a full narrative of occurrences, will no doubt be given in the report of Lieut. Gordon to the Minister of Marine; but in order to make the present report intelligible by itself, it will be necessary for me here to give a brief sketch of the round voyage.

The vessel which had been chartered by the Government for this service was the steamship "Neptune," belonging to the Messrs. Job Brothers, of St. John's, a wooden vessel of 684 tons burden, which had been built and fitted for the seal fishery. She was navigated by Captain William Sopp, as sailing master, and a competent staff of officers and men. We sailed from Halifax on the 22nd of July, our course lying between Cape North and Cape Ray, and through the Gulf of St. Lawrence and the Straits of Belle Isle. We anchored for an hour at Blanc Sablon, on the north shore, but did not land. On the way up the Labrador coast, we called at Ford's Harbor, Nain and Nachvak, for the purpose of engaging an Eskimo interpreter, which we succeeded in doing at the last named place.

The first station was built on the north-west point of the promontory between Ungava Bay and the Atlantic, or near Cape Chudleigh. The second station was to have been placed on the southern or western part of Resolution Island, but we did not succeed in finding a harbor on these shores, and could not land on account of the stormy weather; but we got a near view of the west coast of the island, and also of some of the Lower Savage Islands. We therefore proceeded to the locality which had been determined on for the third station, and found a suitable place on the south side of Big Island, which is just west of the Upper Savage Islands, at an inlet about two miles east of North Bluff. We next crossed the Strait to Cape Prince of Wales, south south-west of North Bluff, and erected a station on the shore of the bay, inside of the cape, or on its eastern side. From this place we next made the south point of Nottingham Island, and established a fourth observatory. Again crossing the Strait in a southerly direction, we passed close to Digges Island, and coasted down the eastern side of Mansfield Island, looking for a suitable place for another station, but without success. The south-east shore of Southampton Island was also coasted for some distance, after which we traversed the northern part of Hudson's Bay to the entrance of Chesterfield Inlet. We did not land in this neighborhood, however, but turned south and called at Marble Island, where we anchored and spent one day ashore. From this island we made Cape Churchill, and then entered the harbor of the same name, at the mouth of the Churchill River. A short visit was paid to York Factory, from which we recrossed Hudson's Bay to Digges Island, where a fifth station was built. On our homeward voyage through Hudson's Strait, we visited all the other stations in the reverse order in which they had been established. Another attempt was made to stop at Resolution Island, in order to build a station, but again without success. It was then decided to place the party intended for Resolution Island at Nachvak Inlet, and we called there for this purpose and to leave our Eskimo interpreter, on our way to St. John's, which we reached on the 11th of October, and immediately handed the

ship over to her owners, four days before the date fixed for the expiration of the charter. On the morning of our arrival at St. Johns, we happened to catch a steamer for Halifax, and so were enabled to continue our homeward journey without an hour's delay.

Before proceeding to give details of my special work, I may say that at every place we visited I obtained as full notes as my opportunities would permit in regard to the geology and mineralogy of the surrounding country. I also endeavored to obtain from the natives information as to the occurrence of useful minerals, which, although not very definite, may in some cases lead to valuable discoveries. The Eskimo are intelligent and good observers, especially of such matters as affect their own mode of living and although rocks and minerals would not be expected to interest them much, still I found that in some instances they had taken notice of them. In order to facilitate enquiries I had provided myself with a collection of all the ores, minerals and rocks which might be expected to occur in the regions we were to visit, and on allowing the natives to inspect them, they would point out those which they thought similar to certain kinds which they had noticed in their own districts. An interesting feature in the geological phenomena of these northern regions, is that a study of them will assist us in the elucidation of the superficial geology of the more southern portions of the Dominion, which forms so important a branch of the work of the Geological Survey.

In regard to zoology, efforts were constantly made to collect specimens in every class of animals and to obtain new information on all points with reference to them. Upwards of fifty specimens of mammals and birds were obtained, of which a portion were from Dr. Matthews, of York Factory. Some of these are rare and will prove to be very useful and interesting additions to our museum. Many notes were made on the habits and distribution of the mammals and birds. Attention was paid to the fishes and their food and to the subject of possible fisheries in these regions. A variety of mollusks and other invertebrates was secured by dredging. As we were living mostly on ship-board and in so cool a climate, but little could be done for the science of entomology. A small collection of butterflies and moths from the shores of Hudson's Strait have been sent to Mr. H. H. Lyman, a well known entomologist in Montreal, who has agreed to identify them. One of the missionaries on the Labrador coast has kindly promised to collect the Lepidoptera of that region and send them to me next year.

With regard to botany, as complete a collection of plants as possible was made at every place we touched at. These are in the hands of Professor Macoun and a catalogue of them will be found in the Geological Survey Report. Some new facts of interest in regard to the ranges of forest-trees in the Labrador peninsula and the country west of Hudson's Bay were ascertained from persons acquainted with these regions.

In addition to the technical assistance already acknowledged above, I take this opportunity of mentioning that Professor C. Hart Merriam has kindly aided me in making out from my descriptions, the local names, &c, with which he is familiar, the accompanying list of the seals of Hudson's Bay and Strait. I may mention that Professor Merriam, who is justly regarded as a high authority on the Pinnapedia, has himself gone to the Newfoundland and Labrador seal fishery, and travelled in the Gulf of St. Lawrence for the express purpose of studying these animals. It would appear from my observations that we have in both Hudson's Bay and Strait all the kinds of seals found at any season either in the Gulf or on the coast of Newfoundland and Labrador; and from all that we could learn, both seals and walrus are abundant in the Strait and the northern parts of the Bay. But in order to obtain them in large numbers for commercial purposes, their various resorts and the course of their migrations at different seasons of the year would require to be studied. The gentlemen in charge of the observatory stations were instructed to attend to such matters, and their notes will probably throw some light on the subject in the particular localities at which they are stationed. In the list of fishes, I have included species which I had in previous years ascertained to exist in Hudson's Bay or the waters immediately connected with it. Mr. Lucien M. Turner, who has spent two

years in the Ungava district in the interest of the Smithsonian Institution, has kindly determined some of the fishes which I collected, and added the names of others which he found in the district named.

I secured about sixty-five photographs of a uniform size of 8 by 5 inches. These are illustrative of subjects of interest in connection with the expedition, of the nature of the country and more especially of points bearing on its geology.

I shall confine myself in the following pages to the subjects above referred to, as all others connected with the work of the expedition will probably be fully reported on by Lieut. Gordon. In regard to the arrangement to be adopted in this report, it has been considered best to state the facts and observations in the order in which they were noted, and in connection with them to give other information, bearing on the subjects referred to, which may have been gathered in previous years.

As already mentioned, we anchored for an hour at Blanc Sablon on the morning of the 26th of July. Here the horizontal strata of the Quebec group form a conspicuous feature in the landscape. They are described at pages 287 and 288 of the *Geology of Canada* as consisting of 231 feet of red and grey sandstones and fine conglomerates forming the lower part of the section, with 143 feet of grey, redish and greenish limestones resting upon them. In Forteau Bay, a short distance east of Blanc Sablon, a considerable collection of fossils was made in these limestones by the late Mr. James Richardson, which proves them to belong to the Quebec group, and to be equivalent to the Red Sand-rock of Vermont. The Laurentian gneiss may be seen cropping out from beneath these sandstones at and near the sea shore, while the hills of the same formation rise above the level of the summit of the horizontal strata all along in the interior.

At the entrance to Chateau Bay on the Labrador side of the Straits of Belle Isle, opposite to the northern extremity of Newfoundland, are two islands, called Castle and Henley's Islands, which are capped by flat basaltic summits, the former being 200 feet above the sea. They form a striking contrast to the prevailing character of the shore rocks, which everywhere else in the neighborhood appear to be of Laurentian gneiss. Later in the season I was informed that some men had been mining mica on the shore of this bay, and in the autumn had brought about one ton of the mineral to St. Johns, on the way to Boston or New York, but that the plates did not exceed three by six inches in size, and that they were of a rather dark color.

After passing the Straits of Belle Isle, the Labrador coast continues high and rugged, and although there are some interruptions to the general rule, the elevation of the land near the coast may be said to increase gradually in going northward, until within seventy statute miles of Cape Chudleigh, where it has attained a height of about 6,000 feet above the sea. Beyond this, it again diminishes to this cape, where it is 1,500 feet. From what I have seen of the Labrador, and from what I have been able to learn through published accounts, Hudson's Bay Company's officers and the natives, and also judging from the indications afforded by the courses of the rivers and streams, the highest land of the peninsula lies near the coast all along, constituting, in fact, a regular range of mountains, parallel to the Atlantic seaboard. In a general way, this range becomes progressively narrower from Hamilton Inlet to Cape Chudleigh.

The distance from the Straits of Belle Isle to Cape Chudleigh, along the Labrador coast, is 760 English statute miles. This is divided into three principal courses, as follows: From Belle Isle to Porcupine Bay, due north (true), 120 miles; from Porcupine Bay to Nain, north-west (true), 290 miles; from Nain to Cape Chudleigh, north north-west (true), 350 miles. The coast-line is everywhere indented by inlets or fjords, and fringed with islands of all sizes, from mere rocks up to some measuring twenty-five miles in length. Most of the fjords are narrow and about twenty-five miles long; several are thirty-five miles, and Hamilton Inlet runs in from the open sea a distance of 160 miles. The general bearing of the fjords is at right angles to the coast line in the neighborhood. In a great many cases the islands are separated from one another, or from points on the mainland, by very narrow straits, with deep water, which have received the name of "tickles." With regard to the condition

below the level of the sea, it is stated in the *Newfoundland Pilot*, published by the Admiralty, that the shores from Davis' Inlet to Nachvak are comparatively free from reefs and sunken rocks, but that from Nachvak to Cape Chudleigh they are fringed with islets and rocks, to an average distance of five miles out. The coast of Resolution Island seems to be similarly studded with these impediments to navigation, and these circumstances appear to be connected with certain geological conditions, which will be referred to further on.

In approaching Ford's Harbor, which is on the eastern point of Paul's Island, the islands near which we passed consisted of bare rock, and although usually high and steep, they had rounded or glaciated outlines. Numerous perched boulders lay about, either singly or in groups or rows, on the naked surface of the rock, wherever they could find a resting place. A short distance off the entrance of the harbor, we passed an island which, on the top and one side was literally piled with rounded boulders. On this island I noticed a dyke of trap about 100 feet thick, cutting the gneiss in a west-north-westerly direction. On going ashore at Ford's Harbor, I found the gneiss to consist of common reddish and greyish varieties, some parts of it massive and others more finely and distinctly laminated. The average strike was south-east (true). The glacial striæ were quite distinct in many parts, but were best preserved near the shore. They run in two principal directions, S. 45° E., and S. 80° E. (mag.) Perched boulders were observed on all the surrounding hills. In going from Ford's Harbor to Nain we followed the channel on the north side of Paul's Island. The rock appeared to be dark, massive and crystalline.

Our stay at Nain was so short that I had only time to examine the high ridge or mountain to the north and north-west of the Mission Station. The first shoulder of this ridge, we were informed, has a height of 875 feet above the sea, but the summit, a short distance further inland, must be at least 200 feet higher. The rock here consists of a rather light grey gneiss, which strikes S. 45° E. (mag.) The glacial striæ, which were seen with greater or less distinctness, all the way to the summit, run S. 65° E. (mag.) or about parallel to the valley which extends inland from the head of the fjord up which we had sailed to Nain, and with the same general bearing. Well rounded boulders were scattered over the flanks and summit of this high ridge; and they were quite prominent on the high bare hills on both sides of the inlet, all the way from Ford's Harbor. The appearance of the top of this mountain, with the boulders resting on the bare, sloping rock, is shown in one of the photographs taken at this spot. Mountains of equal and greater height were seen in all directions from this summit, except towards the eastward, where they die down to the sea level in the distance. On the next hill to the north-west, the weathered surface of the rock showed a rusty belt of a brownish color, and of considerable extent, which was supposed to be due to iron pyrites. I was informed by the Moravian missionaries at Nain that the labradorite of this part of the coast is to be found at different places on Paul's Island, and at a fresh-water lake called Nunaingok, which lies at no great distance inland from the head of a bay to the north-westward of Nain. They said it was also reported to occur on a bay a short distance to the southward. I had not an opportunity of visiting any of these localities, but from specimens which I have seen, I have little doubt the mineral occurs as veinstones, in which there are also crystals of pyroxene, iron pyrites and magnetic iron. In this connection it may be mentioned that I have seen a large specimen of coarsely crystalline labradorite rock from Hamilton Inlet, in which some of the faces showed a blue iridescence. The rose-red variety of anorthosite, called labrobite by Gmelin, is stated to come from an island called Amitok, on the old charts of the Labrador coast, about forty-five miles northward from Nachvak. When at Nain I obtained specimens of amazon-stone, which the Eskimo told me came from Port Manvers, and of paulite, a variety of pyroxene or hypersthene, which has also been called "Labrador hornblende" and "metalloidal diallage." It was said to have been brought from Paul's Island. Mr. John Ford informed me that yellow mica, in flakes about the size of one's hand, was found on this island, about two miles north-westward of Ford's Harbor. In regard to the rocks and minerals of the Labrador coast, the fol-

lowing notes may be here given: I have received specimens of copper pyrites in a dark slate, which were labelled as having come from Indian Island, on the north side of the entrance of Hamilton Inlet, and I have been otherwise informed that slates or schists occur in that neighborhood. A man from Nova Scotia stated to me that he had been engaged, with others, two years ago in mining copper and lead ores on Deadman's Island, which is situated a few miles north of Hamilton Inlet. They occurred in a vein between a rock like granite and a sort of sandstone or quartzite. Mr. King, the second mate of the "Neptune," said that copper ore was also found at Iron-bound Island or "Makoubik" (probably Makkovik of the chart), not far from Cape Harrison. One of the gentlemen we met at Nain informed me that he had heard of copper ore being found somewhere to the southward of that place, but was not aware of the locality. These circumstances point to the possible occurrence of deposits of copper in quantities of economic value on this coast. It is well known that productive mines of copper were in operation for a number of years on the adjacent coast of Newfoundland.

At Nain I noticed some freshly split slabs of a grey felsitic slate, which were being used as flag stones, and, on inquiring, was informed that they had been brought from Ramah, in the bay next south of Nachvak, where there was said to be plenty of this rock in situ. The name of the bay is Nullataktok, or Slate Bay. Our Eskimo interpreter, Lane, who was well acquainted with this bay, afterwards informed me that slaty rocks were abundant there.

While at Ford's Harbor and Nain I collected as many plants as the limited time would permit, and Professor Macoun's list of them will be found in the appendix. The Rev. Dr. S. Weiz, who had long resided at Nain, had made a collection of the plants of the vicinity, which he had submitted to some of the leading botanists of Europe, who had attached the proper name to each specimen. He kindly allowed me to make a list of these and it is also given in the appendix, in one of the columns of the general list.

Although timber disappeared from the outer coast before reaching Nain, yet groves of trees may be seen in the valleys and on the more favorable slopes at the heads of the inlets, and we were informed that after going ten to twenty miles inland from Nain, or from the coast for a considerable distance north of it, the whole country may be said to be wooded, as far as the condition of the surface will permit of the growth of trees, and that in favorable situations the spruce and tamarac attain a sufficient size to be sawn into lumber. At Nain, the trees consist of spruce, tamarac, and small willows, but at no great distance inland, balsam fir, poplar, white birch and rowan begin to make their appearances.

In the gardens at Nain I observed the following vegetables: potatoes (a variety with low, flat, spreading tops), turnips, carrots, beets, cabbage, Scotch kail, a very rank variety of spinach, lettuce, peas, beans and onions. There was also a great variety of flowers. The peas and beans were arranged so that they could be protected by glass if requisite, and the potatoes were planted in narrow beds, arched over with bent rods so that long sheets of coarse canvas could be thrown over them on frosty nights.

Leaving Nain, our next stopping place was the Inlet of Nachvak, about 140 miles south of Cape Chudleigh. This inlet or fjord, with an average breadth of from a mile to two miles, runs in from the open sea a distance of about forty statute miles. The water in it is very deep, and the mountains on either side immediately overlooking it rise to heights of from 1,500 to 3,400 feet, but a few miles inland, especially on the south side, they appear to attain an altitude of 5,000 to 6,000 feet, which would correspond with the height of The Four Peaks, near the outer coast-line, about midway between Nachvak and Cape Chudleigh. The mountains around Nachvak are steep, rough sided, peaked and serrated, and have no appearance of having been glaciated, excepting close to the sea-level. The rocks are softened, eroded and deeply decayed. On precipices and steep slopes the stratification is well brought out by the weathering, so that the dips may be distinctly seen. The mountains on the north side proved to be mostly Laurentian

gneiss, notwithstanding their extraordinary appearance, so different from the smooth, solid and more or less rounded outlines of the hills composed of these rocks in most other parts of the Dominion. On the present occasion we stopped only at the Hudson's Bay Company's post, at a narrow part of the fjord, about twenty miles in from the open sea, and I had a few hours to examine the rocks, collect plants and take photographs in the neighbourhood. But in returning, in the month of October, we stayed for several days at a bight on the north side, a few miles from the entrance, where we built a station, and named the place Skynner's Cove. This enabled me to extend my explorations of the neighbourhood, and I shall now state the results of my observations on both occasions.

On the south side of the inlet at the Hudson's Bay Company's post, an escarpment rises to a height of 3,400 feet, as ascertained by Commander J. G. Bolton, R. N., but I had not time to visit it to determine the nature of the rock. A brook, which gathers its waters from higher ground further back, but which is not visible from the post, precipitates itself from the top of this great precipice in an almost perpendicular fall. The rock on the north side at this place consists of reddish gneiss, somewhat contorted and occasionally interstratified with dark micaceous layers. Two or three miles east of the post a good sized brook falls, in several almost perpendicular leaps, a height of 300 or 400 feet over these rocks. The strike of the gneiss in the neighborhood of the falls is S. 35° W. (true.)

At a point on the north side, estimated to be about nine miles from the open sea and eleven from the post, opposite to a bay on the south side, a mountain rises steeply to a height of 1,500 or 2,000 feet. It is composed of gneiss standing vertically and striking N. 25° W. (true), cut diagonally by a great many dykes of dark trap all underlying westward at an average angle of about 30° from the perpendicular. Some of them run together and others appear to die out in both directions on the cliff section. Some dykes of close-grained, almost black diorite, also cut the gneiss in the vicinity of Skynner's Cove. From the point above named to Skynner's Cove the rock along the north side appears to be all gneiss with a variable strike in different parts. Around this cove there is a variety of micaceous, and hornblendic schists passing into thinly bedded gneiss. The average strike is about S.W. (true). I was informed by our interpreter, whose home is on the south side of the inlet, that the Eskimo obtained a kind of soapstone for making their pots in the vicinity of Skynner's Cove before they were able to procure others of metal. Along the northern part of the entrance to the inlet or about North-Head of the chart, the rock is a coarse, dull red syenitic gneiss. At one place it encloses a mass, like a bed, of nearly white quartzite marbled with small elongated gray patches, but it appears to be cut off as it runs up the slope, although another exposure of white rock was seen some distance off in a north-easterly direction. Here the glacial striae were seen on projecting points near the water, running with the axis of the inlet or about east. At Mount Razorback, which forms the outer point on the north side of the Nachvak Inlet the stratification is well seen, the dip being to the southward. The angle of dip on the outer or eastern part of the mountain is almost 60°, but this diminishes to 45° and finally to less than 10°, in going to the south-westward. Several large but somewhat irregular dykes of black-looking rock cut the strata of the mountain side at right angles to the dip in its varying inclinations.

On the opposite or south side of the entrance of the Nachvak Inlet, the dip of the bedding is S. S. W. (true), and the inclination, generally from 35° to 40°, but at one part it is 60°. Dykes were seen all along, cutting the face of the mountain range and running in a south-easterly direction.

On the west shore of the first cove, from the entrance, on the south side of Nachvak Inlet, the rocks consist of a coarse-grained slaty tufa or breccia, thickly studded with grains of quartz-opal. To the north, this passes into a sort of coarse cleavable grey syenite, which could be traced for two miles westward along the shore; while to the south of it is a coarse grey mica schist, running N. 25° W. (mag.) vertical. In this rock, and near the slaty breccia, a vein of quartz was found, from a foot to two feet in thickness, and holding patches of brown-weathering calcspar.

The rocks in the mountain, overlooking the south side of the inlet, opposite Skynner's Cove, have a slaty appearance, with some great bands of a light color and more solid aspect, the outcrop running nearly horizontally for some distance. I was unable to visit these bands, but our interpreter brought me a specimen, which he said he had broken off one of them, and which proved to be a fine-grained light grey, silicious schist, which makes excellent hones. These and the other rocks on the south side of the inlet in this neighborhood, which have just been described, as well as a part of those on the north side, may belong to the Huronian series. Slaty rocks have been mentioned as occurring at Ramah, in the inlet, about twenty miles south of Nachvak. From the specimens which I have seen, these are probably of the same age, and they may be connected as one area with the supposed Huronian strata of Nachvak.

We were informed, both by Mr. George Ford, the agent of the Hudson's Bay Company at Nachvak, and our Eskimo interpreter, that at a short distance beyond the more distant mountains, seen to the west of the company's post, the country falls rapidly on the inland side, and soon becomes comparatively level. This description agrees with other accounts of the interior of the Labrador in the Ungava district. A wide level tract embracing the country drained by the George, the Whale and the Koksoak, South, Big or Ungava Rivers, is said to extend southward a long distance from Ungava Bay. The surface is reported to be covered with a wet, peaty moss, growing upon barren sand, with the solid rock everywhere at a short depth beneath. The rivers and brooks are fringed with spruce and tamarac trees, but very little timber is to be met with between them. The mouth of the Ungava River is 155 miles south-west of Cape Chudleigh. In going by sea, from one to the other, Commander Bolton says, in the *Newfoundland Pilot*: "The high land of the Labrador shore could be seen towering above the scarcely discernable shore of Ungava Bay, for the first sixty or seventy miles." The Ungava River is navigable for sea-going vessels to a point three or four miles above the Hudson's Bay Company's post, Fort Chimo, and boats may ascend it for seventy or eighty miles. The river is from one-quarter of a mile to a mile and a-quarter in width. Its upward course is S. by E. (true), and it passes through a barren undulating country. Spring tides at Fort Chimo rise $38\frac{1}{2}$ feet, and the rapid currents produce dangerous whirlpools. Salmon frequent the rivers of Ungava Bay in great numbers, and for some years the Hudson's Bay Company have annually sent a cargo of them, in a frozen state, by a small steamship, to the London market, in addition to a considerable quantity of the salted fish. Besides salmon, the trade of this port consists of furs, seal and white porpoise oil, and deer skins, and is carried on with the Eskimo of the coasts, Cree Indians from the south-western interior, and Nascoie Indians from the south-eastward.

Spruce timber begins to be met with, according to all accounts, about thirty miles to the south-west of the Hudson's Bay Company's post at Nachvak. The tamarac follows a short distance further south. To the westward of Nachvak, the northern limit of the spruce, according to Capt. William Kennedy, reaches the shore of Ungava Bay, north of the George River. On the western side of this bay the Eskimo informed me it begins to be found in the neighbourhood of Bay of Hope's Advance, or five days' journey south-eastward of Cape Prince of Wales, on the south side of Hudson's Strait, and that in this neighbourhood it was found further north in the interior than near the coast. In addition to spruce and tamarac, balsam-fir, canoe-birch, aspen and balsam-poplar are reported, on good authority, to exist in the interior of northern Labrador, but at some distance further from the coasts of the Atlantic and the Strait than the first mentioned.

On the East-main coast of Hudson's Bay the northern limit of the spruce was found to be a few miles north of Richmond Gulf, but it was reported to extend much further north at a distance inland from this coast. On the west side of the Bay it was seen in considerable quantities all along the coast, from Cape Churchill to Button's Bay, and Mr. George McTavish, who has made several coasting voyages to the north, and who, at my request, has kindly made observations and collected information from the natives in regard to the distribution of timber, informs me that it

leaves the shore about twenty miles beyond Seal River. He was told by the Eskimo of these parts, who travel a good deal in the interior, that spruce timber begins to be met with at two days (say fifty-five miles) west of the mouth of Big River, and that it is considerably further inland, opposite to Eskimo Point, which is about in latitude $61^{\circ} 40'$. From this neighbourhood it runs west north-westward and crosses the Coppermine River about twenty miles from its mouth, and thence reaches nearly to the mouth of the Mackenzie River.

On leaving Nachvak, we sailed up the coast, passed round Cape Chudleigh, through Gray's Strait, which is between it and the Button Islands, and entered Ungava Bay. According to the chart and the *Newfoundland Pilot*, the cape rises to a height of 1,500 feet above the sea, and the highest point of the Button Islands has an equal elevation. The outlines of these islands and of the southern shore of Gray's Strait, although bold and steep, are rounded, as if they had been glaciated. At the west end of the south-eastern island of the Button group a great rock has been excavated into the form of a half arch, which rises out of the water and rests, at its summit, against the cliff which forms the extremity of the island. The rocks of the islands and the south side of the strait appear to be all gneiss.

On the Ungava Bay side of Cape Chudleigh we entered an inlet about ten miles southward of the extremity of the land, and discovered a harbour on its north side, which we named Port Burwell, after Mr. H. W. Burwell, the gentleman who was left in charge of the station (No. 1) which we built here. The hills, for a few miles around Port Burwell, are only moderately high and are not generally steep. Their outlines are rounded and their rocky surfaces have scattered upon them numerous boulders as well as finer rocky *débris*. The rock everywhere consists of ordinary varieties of gneiss, the commonest of which are massive reddish and dark hornblende and micaceous. The strike at the Port varies from $N. 20^{\circ} E.$ to $N. 40^{\circ} E.$ (mag.) The glacial striae at the observatory station run $S. 35^{\circ} E.$ (mag.), but among the hills in the neighbourhood they were observed to follow the trends of the valleys with a general south-eastward course by the compass. A short distance south of the station, a vein, varying from 8 to 13 inches in width, occurs in the gneiss. Its direction corresponds nearly with the strike, which is here $N. 20^{\circ} E.$, running with the stratification for a short distance, breaking across to other beds, following them for a short distance and then jogging off to others. It consists of light grey dolomite and white quartz, holding a little iron pyrites and some crystals of quartz, rendered ruby-colored by a layer of oxide of iron under the faces.

From Port Burwell I explored the inlet to the south-eastward, and found it to be a strait dividing into two branches at five miles from the Port, the northern of which was ascertained to run through to the Atlantic. The Eskimo whom we met in this strait informed us (through our interpreter) that the southern branch also continued through to the ocean. They also told us that there was no other channel to the south of this between Ungava Bay and the sea to the east. We named this newly found channel McLellan's Strait, in honor of the Minister of Marine and Fisheries, and the north-west point of the main land, Cape William Smith, in honor of the Deputy Minister. At six miles from Port Burwell the northern branch of McLellan's Strait has contracted to half a mile in width, and has become flanked by high and steep hills, rising from either side. The tides, which at springs have here a rise and fall of upwards of twenty feet, run with great velocity through this narrow part. The locality is called Nunaingok by the Eskimo, which means the Hidden Place, and the same name is applied to one or two other localities on the Labrador coast. In proceeding from Port Burwell to Nunaingok, our course was $S. 5^{\circ} E.$ (mag.) or $S. 55^{\circ} E.$ (true), and the country on either side of McLellan's Strait showed less and less evidence of glaciation. Even close to the shore, in approaching the higher hills which begin at Nunaingok, the gneiss is deeply decayed, the softening process having extended particularly along the joints which run both vertically and horizontally, leaving only hard kernels with a more or less rounded outline, between them. Nunaingok is situated on an alluvial flat, extending between the two branches of the strait. The hill which rises steeply on the south side of it is about 700 feet high; but

further in, between the branches and on either side of them, the mountains are from 1,500 to 2,500 feet high, and have rugged tops and sides. Rounded boulders were found scattered all over the side and top of the hill just referred to; but although it had probably been somewhat glaciated, it had not been planed down to hard surfaces, but had an irregular outline, and the rocks were much disintegrated. Among the transported boulders and pebbles scattered over its surface, some of brecciated drab limestone with clear quartz grains, pinkish red sandstone, red jasper and magnetic iron, were noticed. Fragments of grey, drab and yellowish limestone, with obscure fossils, were common around the base of the hill. The glacial striae were well seen on the southern side of the hill referred to, where, in one case, they were observed to groove longitudinally a vertical wall, and even the under side of an overhanging shelf of rock. The general direction was S. 25° E., or with the course of the south branch of the strait.

The fixed rocks around Nunaingok, as far as I had the opportunity to examine them, were all gneiss, the average strike of which was N. W. (true.) On one of the mountains on the north side of the northern channel a wide belt of brown, iron-stained rock runs diagonally through the ridge, the color being probably due to the decomposition of iron pyrites, but I had not time to visit the place.

At Nunaingok, on top of a bank of sandy earth, are the remains of an old Eskimo village. The roofs of most of the underground houses had fallen in, leaving only large circular pits. Some of these had become partially filled up, showing great antiquity. A few of the newest of them had been inhabited within a year. Some Eskimo camped in the vicinity informed us, through our interpreter, that this had once been a comparatively populous village, and a resort of their people as far back as their traditions extend. It is their custom to live in the underground houses from the commencement of winter, some time in November, till January, after which they leave them and spend the rest of the winter in igloos or snow houses. The water in the north branch of McLelan's Strait, they informed us, is open all winter at this point, and is much frequented by seals, which afford them a reliable supply of food. These animals they kill either from their kyaks or by spearing them from hiding places which they have built of stones on every ledge and point of rock past which the seals are accustomed to swim. Great numbers of bones of seals, walruses, reindeer, foxes, hares, birds, &c., lie scattered about on the surface and mixed with the earth around the old dwellings. The remains of stone pots and implements near others of European manufacture showed a transition from the barbarous to a civilized condition. I was told by one of the Labrador missionaries, who had had a long experience of these people, that the comforts and conveniences of civilization rendered the Eskimo less vigorous and healthy, and, as a consequence, their numbers are diminishing.

The "Neptune" was anchored in 15 fathoms at low tide in Port Burwell. The bottom was a sandy mud, and was found, by dredging, to abound with shellfish, echinoderms and crustaceans. During our stay, from the 5th to the 8th of August, the water teemed with fine cod, which were taken in great numbers by jigging. Many of them were tolerably large, and they were of excellent quality, contrasting, in this respect, with the cod we had got at Nachvak, Ford's Harbor and a fishing station on some islets we had passed to the south-east of it. Most of our crew had had more or less experience of the Labrador fisheries in previous years, and the superior quality of the Port Burwell cod was a subject of general remark among them. On our return to Port Burwell we found the fish still abundant on the 27th and 28th of September, and the party in charge of the station informed us that they could catch them any time they chose in the interval. At Nachvak the fishermen began to take cod on the 17th of July, and they were catching them in great numbers at the end of the month. During our stay in Skynner's Cove, in the inlet, from the 30th of September till the 6th of October, we caught as many as desired, by jigging from the ship's deck. From all that I could learn by enquiries along the Labrador coast and from our crew, it would appear that although the dates vary in different years and at different places, the average time for the cod to strike the shores is the middle of July, and that the particular time at any locality depends more on the presence or

absence of ice than on its latitude. If this condition happened to be the same all along, the fish would appear at the same time at every part of the coast. This would be the natural inference, since there appears to be no other difference in the conditions which would affect the cod along the whole coast. Bait is used as far north as Cape Harrison, but beyond that the fish are so numerous and voracious that the naked jigger alone is required. The fish are dried on flakes as far as Indian Harbor, but on the more northern parts of the coast they are spread upon the shingle or the smooth, rounded rocks.

Station No. 2 was intended to be placed on Resolution Island, or one of the Lower Savage Islands to the north-westward of it; but after spending part of two days in endeavoring to find an anchorage or a harbor on these islands, the attempt was abandoned until we should be returning after establishing the remaining stations. A near view of Resolution Island was not obtained on this occasion, but the southern shores of the Lower Savages were seen closely enough to determine the rocks to be massive gneiss, of which the prevailing color was red. The iron bound shores of these islands rose abruptly several hundred feet above the sea.

On leaving the Lower Savages we proceeded up the Strait to the vicinity of North Bluff, but at a long distance from shore, until we came directly opposite to it. We anchored in a bay two miles east of the Bluff, which we called Ashe's Inlet, after Mr. W. A. Ashe, D.T.S., who was to have charge of the observatory station (No. 3) which we proceeded to erect on the eastern side of the bay.

The rocks on the west side of Ashe's Inlet consist of dark grey gneiss, composed principally of quartz and felspar in even beds. The general strike, which is pretty uniform, is east and west (true), and the dip, north at an angle of 40° . On the higher levels the surface of the rock is decayed into half isolated boulder-like masses. In the vicinity of the station, on the east side, a common variety of gray micaceous gneiss is met with, striking with regularity to the N.W. (true). A mile to the northward, however, on this side of the inlet, it has become east and west (true), corresponding with the strike on the west side. The country was examined for several miles inland, or what I judged to be about the centre of the (Big) island, and found to consist entirely of common varieties of gneiss, with a prevailing westerly strike. It contains many veins of "hungry" or barren milk quartz. Some of them hold felspar and black mica, giving them a somewhat granitic character. In one of them the felspar, which was white, was observed to be striated. The hills have a rounded sweeping outline, and their summits are a considerable distance apart. The wide even spaces between them hold shallow lakes, surrounded with green meadow-like flats and mossy slopes. Numerous rivulets and brooks run down the hills and discharge the waters of one lake into another. The general aspect of the landscape reminds one of some parts of the Highlands of Scotland. A shallow looking lake, with many low stony points, begins about three miles northward of our anchorage, and has a length of about three miles. It discharges south and westward into Ashe's Inlet by a wide, rapid and shallow stream, which we called Edith River. The Eskimo informed us that at certain seasons large trout were abundant in this lake and river.

Around Ashe's Inlet the glacial striæ run about $S. 65^{\circ} E.$ (true). On the tops of the hills the rocks are much weathered and only faint traces of the striæ remain. In these situations ridges of gneiss boulders, with an easterly direction, were occasionally met with. One of them, on a hill a short distance north of the observatory station, has evidently accumulated in the lee of a knob of rock which stands at its western extremity. Among the prevailing gneiss boulders scattered on the hills and plains were found several of grey dolomite like that of the Manitouink group of rocks (Cambrian). See Geological Survey Report for 1877, p. 11 C.) and of the soft buff grey dolomite like that of the Churchill River. (See Geological Survey Report for 1879, p. 18 C.). I also found a large decomposed boulder which had been made up of coarse radiating crystals of greenish grey hornblende. A bed of the same rock was afterwards found interstratified with the gneiss at Cape Prince of Wales, on the south side of the Strait, opposite to Ashe's Inlet. A small piece of greyish crystalline limestone was picked up near

Ashe's Inlet, which bears a very close resemblance to a variety common in the Laurentian bands of the Ottawa valley.

Some heavy field-ice had drifted into Ashe's Inlet before our arrival there. The Eskimo informed us that this was the first time in their knowledge that such a thing had occurred, and this circumstance afforded us another proof of the unusual abundance of this kind of ice the present summer. Several of the pieces or "pans" were upwards of 20 feet thick, and as the tide has here a rise and fall of more than 30 feet, some of them were left dry at low water and were found to consist of solid blue ice. The outlines of these pans, as seen floating in the sea, more frequently approach a quadrilateral form than any other. This kind of ice was afterwards seen in great quantities around Salisbury and Nottingham Islands, in the mouth of Fox's Channel, down which there appears to be no doubt, all the heavy ice of Hudson's Strait, comes. On reaching the Strait it projects towards the south shore and breaks off in fields of greater or less extent which float up and down with the tide, always working to the eastward, and part of it finally escapes into Davis' Strait. Hudson's Strait, however, being about 500 miles long, the tendency of the wind and tide is to drive much of it ashore, or to imprison it in bays and inlets. Once it has reached such situations, the lee afforded by the high lands often prevents it from being drifted out to deep water again. In this way, during the present season, a large quantity of it became fixed in Ungava Bay and detained the Hudson's Bay Company's steamer "Labrador" for twenty-one days, being the first time, I understand, that any detention of the kind has taken place. Mr. L. M. Turner, of the Smithsonian Institution, who was at Fort Chimo at the time, informed us that the thickness of some of these blocks of ice was measured, and in one case found to be as much as 42 feet. Mr. Burwell, at Station No. 1, on the west side of Cape Chudleigh, reported that, during August and September, he observed these heavy pans floating south-westward into Ungava Bay, but never returning past his station. At Ashe's Inlet the observer reported that the ice always floated back, or westward, a short distance, with each tide, but finally disappeared to the eastward. Some of this heavy ice was stranded about Cape Prince of Wales in the latter part of August and the first half of September, but it had all gone when we re-visited the station here on the 23rd of September. At Nottingham Island we observed some of the heaviest "pans" stranded in 6 fathoms of water, and they would, consequently, be about 40 feet thick.

I tested the ice of the stranded pans in some places, and always found it fresh. This would be the case, notwithstanding that the ice formed in sea water, for most of the salt would be thrown out in the freezing, and what might remain would drain away near the surface on exposure to the mild air of summer. Owing to the somewhat poor heat-conducting power of ice, it is not possible that so great a thickness as 40 feet could form in one winter in Fox's Channel. It is probable that a good many years would be required. In regard to the quantity of ice which has been observed in Hudson's Strait, a study of the experience of the vessels which have navigated these waters, as well as of that of the ships of the Moravian Brethren coming to the coast of Labrador, would seem to show that there is a succession of good and bad years, with a minimum, and a maximum at perhaps seven or eight years apart, or in cycles of some fourteen or fifteen years; also, that there may be a maximum intensity in these cycles themselves, so that perhaps every third one will be more favourable in the minimum of ice and more severe in the maximum than the two intervening ones.

The fact that most of the ice-pans of Hudson's Strait, when not covered with fresh snow, are colored with dust and earth, points to their formation near shore, and also to their remaining there during one summer at least, when the ground is bare of snow and the surface not frozen. The dust appeared to be in too great quantity to be of cosmic origin. These pans sometimes carry gravel on their backs, a circumstance which was noted in my report for 1880, p 20 C. When at Ashe's Inlet, a fact was observed which may explain the last mentioned phenomenon. Some tolerably thick ice still remained attached to the shore at high tide mark. During the melting of the snow on the hills above it, torrents had carried a quantity of stones and earth

out of an adjacent bank and deposited them upon the surface of the ice. The connection between this ice and the shore being sufficiently weakened, the next spring-tide would carry it out to sea, as previous tides had already carried parts of the adjoining ice, similarly laden.

The icebergs of Hudson's Strait are of comparatively small size and are or have been mostly flat-topped. The original appearance of some of them has been altered by foundering and canting, which have occasionally been repeated several times, the various positions which the berg has occupied being indicated by water-lines now standing at different angles to the surface. These small icebergs are most numerous along the northern side of the Strait, and they have never been observed west of Fox's Channel, out of which they proceed. They are supposed to originate from glaciers on the shores of this channel, but it is possible that they may come through the passages which are believed to run into it from Baffin's Bay and Lancaster Sound, or through Fury and Hecla Straits, in all of which the current is known to set southward.

The soil or drift material of Hudson's Strait is probably permanently frozen at a certain depth below the surface, although our interpreter told me it was not so at Nachvak, nor does it appear to be the case at Nunaingok, in McLelan's Strait. On Nottingham and Digges Islands, when the gneiss has been glaciated and its hard surface exposed to the cold, it appears to have become so deeply chilled that its temperature does not rise above the freezing point in summer, except in the direct sunshine. Whenever water in small quantities had flowed over these rocks at night or in the shade during the day it had become frozen.

While the "Neptunae" was lying at Ashe's Inlet a party of Eskimo from the eastward came on board. They brought with them plates of good, light coloured mica and pieces of pure foliated graphite, also a small piece of iron pyrites, and one of amorphous graphite. In reply to questions, they stated that they came from a place called Kimnirook, about two days' journey by kyak, to the eastward, and that they had gathered these specimens in that vicinity. They further stated that there was plenty, both of the mica and the foliated graphite. Having assembled these visitors, and also the Eskimo of North Bay, who were already at the Inlet, a party of thirty-eight in all, I exhibited to them my collection of minerals, and passing them round, one at a time, enquired successively if any of them had ever seen a mineral like that. In return for any information which they might give, I offered them tobacco, ammunition, kettles, &c., all of which they coveted very much and might easily have invented stories as to the occurrence of minerals in these regions in order to gain the articles offered. But the only kinds they recognized, besides those of which they had brought the specimens above mentioned, were a bright red hematite occurring inland from Kimnirook, and a rather hard and inferior variety of soapstone, which they used for making pots before they obtained metal ones from the white men, at the western end of Big Island (in which this inlet and North Bluff are situated). They said they had observed plenty of hard white stones, like the quartz exhibited, in various localities, but no soft white ones such as the marble, gypsum, barytes, &c., the hardness of which they tested with their knives.

During our stay at Ashe's Inlet, the Eskimo killed two reindeer in the vicinity, and, judging from the numerous tracks, of these animals they would appear to be common; but the natives informed us that they were much more abundant on the mainland to the north, where they are in the habit of hunting them most of the summer, coming again to the sea shore to live on seals and walrus during the winter. Three young harp seals were killed in the inlet during our visit, and as we steamed out of it we saw two walrus. One of our party obtained the tusk of a narwhal from the Eskimo who visited this inlet. Arctic hares were numerous on a small island, to which the foxes could not gain access. Gulls, gannets, guillemots, eider ducks and ptarmigan were the commonest birds. The young of the last named were about three parts grown on the 15th of August, and could fly with the adult birds. The Eskimo informed us that large trout were abundant, at certain seasons, in what we named Edith Lake and River, a few miles north of the observatory station.

Driftwood, all spruce, of which a considerable quantity had been seen at Port Burwell and in McLellan Strait, was entirely absent at Ashe's Inlet, and Nottingham Island, and was scarce at Digges Island and Cape Prince of Wales.

We left Ashe's Inlet on the evening of the 16th August, and arrived at Cape Prince of Wales, on the opposite side of the Strait, on the morning of the 17th, the distance being about 60 geographical miles, and the course about S. S. W. (true). Prince of Wales Sound lies to the south-eastward of the cape, and appeared to be about 15 miles broad. We selected a place on the inner side of the cape for building the observatory station, and named it Stupart's Bay, after Mr. R. F. Stupart of Toronto, who was to have charge of it. The highest hill on the west side of the bay was ascertained to have a height, according to the barometer, of 340 feet, and the highest to the south of it to have a height of 180 feet. The rocks in the vicinity of the bay were found to consist entirely of Laurentian gneiss. In the hills on the west side of Stupart's Bay, the strike is from S. to S. 40° E. (mag.), or nearly east and west (true). The gneiss in the hills, both to the south and west, is cut by numerous veins and bunches of milk-white quartz, which in various parts are so conspicuous on the bare surface as to be seen from considerable distances. In one place on the eastward slope of the hill to the west a group of parallel veins of this mineral, varying from a foot to two feet in width, is traceable for some distance. Their course is slightly sinuous, but the average run is N. 55° W. (mag.). Red felspar occurs in some of these, and occasionally a little black mica. The top of this hill is rounded and striated. The glacial grooves are quite distinct. On the highest point their direction is S. 60° E. (mag.). A little below the summit, on the south side, they run S. 50° E., while at the observatory station, near the sea shore, their course is S. 40° E. (mag.).

Viewed from the top of the hill just referred to, the slopes and valleys to the north-eastward are full of ponds resting in basins of solid rock. Boulders are perched on the summits and slopes of all the hills around. Beaches of shingle, as fresh looking as those on the present sea-shore, except that the stones are covered with lichens, may be seen at all levels, up to the tops of the highest hills in this vicinity. The long sloping hillside to the south of the observatory station is covered with fields of shingle and small round boulders, all blackened by the lichens. At the northern base of the ridge, to the north-west of the station, is a large dry basin-like depression, with a notch on the outer side, through which it has formerly communicated with the sea. From the notch, the shingle and mud are spread over the floor of the basin in a fan-like fashion, as if the tides had rushed violently in through this opening. The materials of the raised beaches above referred to consist principally of gneiss with milk quartz from the veins of the neighbourhood, together with a few fragments of yellowish grey dolomite, with obscure fossils, a hard and nearly black variety of silicious clay-slate, with an occasional boulder of dark, hard crystalline diorite.

Prince of Wales Sound has a breadth of, apparently, about fifteen miles, in a due S. E. bearing from Stupart's Station, on the inner side of Cape Prince of Wales, and of probably eight or ten miles in a southerly direction. A long arm, the north shore of which I reached at two and a-half miles due S. W. from the station, runs due west from the western side of the sound. This appeared to be the favourite resort of the Eskimo, and I propose to name it, for convenience, Eskimo Inlet. A small rapid river was crossed between the station and the inlet. The Eskimo informed me that another river enters the head of this inlet, and that it passes through two good sized lakes not far from the sea. Some large trout, which they had brought to the ship, were stated to have been caught in this river. Salmon were said to be found in another river entering the sound at a point about south of Stupart's Bay.

The hills of gneiss between Stupart's Station and Eskimo Inlet are pretty thoroughly glaciated. The ridges and hummocks, as a rule, present smooth gradual slopes to the west and abrupt craggy faces to the east, showing that the movement of the ancient ice was from the west. The striæ are well seen in many places on the hills, the average direction being S. 40° E., (mag.) or about due east, astronomically. On the shore of the inlet they run a little north of true east or parallel with the course

of the inlet itself. Here I found a good many boulders of grey and yellowish limestone on the beach.

The gneiss along the northern shore of Eskimo Inlet is of the ordinary variety, and has an average strike of N. 20° W. (mag.) One of the veins of white quartz in this locality contains purplish red calcspar, in rather coarse crystals of a uniform size, both the color and texture closely resembling some varieties of the banded crystalline limestones of the Laurentian series in the County of Lanark. Dark crystals of epidote occur along with it. Light green amorphous epidote and a bright red felspar are associated in some of the quartz veins of the vicinity. One of the Eskimo had a small lamp made of a soft, grey variety of schistose mica rock, which he said occurred on an island in Prince of Wales Sound.

From a hill near Eskimo Inlet a view was obtained far inland to the west. The surface of the country in that direction appears in long sweeping outlines, terminating in mountain ranges in some of the higher parts, and resembles the landscapes in various parts of Newfoundland.

The Eskimo report reindeer to be plentiful around Prince of Wales' Sound at certain seasons, being most abundant, I understood, in the winter. During the interval between our two visits to the sound, the natives killed several, and a member of the observatory party shot one in the vicinity of Stupart's Bay. These people also told us that the polar bear was common on the southern shore of the Strait, to the west, and that Ane-ugi, or Snow Island, about eight miles above Cape Prince of Wales, was a favourite place for them to land. The walrus is found at this cape at most seasons of the year. We saw several in going out and in with the "Neptune," and our interpreter killed one while we were lying in Stupart's Bay.

The Greenland, or harp seal, (*Phoca grælandica*, Fabricius) was the species on which the Eskimo were living during our visit to Prince of Wales' Sound, but they had in their possession the skins of a good many harbor and square-flipper seals. (*Phoca vitulina*) (Linn.) and *Erignathus barbatus* Fabricius). Some of the last mentioned were very large, stretching from the apex of a wigwam to the ground, and measuring 11 or 12 feet in length.

In reply to questions put to the Eskimo here, through our interpreter, they informed us that not only the Strait itself, but even Prince of Wales' Sound, did not freeze over in the winter, but that ice drifted up and down with the tides. They stated that ice formed in the coves and around the shoals and islands off the cape. The chief reason why they live in this vicinity is that Cape Prince of Wales being "a good place for ice" they are more certain of a steady supply of seals and walrus than elsewhere.

As to the supposed passage or channel between Bay of Hope's Advance and Mosquito Bay, they did not appear to have any personal knowledge. Our interpreter did not think it existed, but as he came from the eastern Labrador, he had no definite idea on the subject. Being an egotistical individual, and wishing his own opinion to prevail, it was impossible for me to get a fair expression of the views of these people on this important matter.

We left Stupart's Bay at Cape Prince of Wales, on the evening of the 22nd of August, and arrived at the southern part of Nottingham Island on the morning of the 24th. In passing the south side of Salisbury Island, the hills of the western part were observed to have more even outlines than those of the eastern, as if the glacial force had come from the westward. We anchored in 5 fathoms of water, in an inlet a few miles east of the most southern part of Nottingham Island, and found a suitable place for the station close to our anchorage, and on the north side of the inlet, which we named Port DeBoucherville, after Mr. C. DeBoucherville, of Ottawa, who was to have charge of this observatory.

Around Port DeBoucherville, and for some distance to the westward, the country consists of island-like hummocks of rock, more or less separated from one another and surrounded by clayey mud. The lower parts of these muddy intervals are partly overflowed by the tide, rendering the water turbid in all the bays and inlets of this part of the island. The clay is mingled with boulders and gravel, and it extends below the bottom of the sea on the one hand, and up the valleys to a height of 50 to

100 feet. In preparing to leave the port, it was found difficult to start our anchor out of the mud, some of which came up on one of the flukes, and proved to be an exceedingly tough bluish-grey clay, containing grains of coarse sand disseminated through it.

I explored the country to a distance of about three miles in various directions from our anchorage, and found the rocks to consist of common varieties of gneiss, the only exceptions noticed being patches of a fine-grained red syenite on both sides of the inlet. The average direction of the strike is south-west (true) but there are numerous local variations which, however, seldom carry its course outside of the south-west quarter of the circle. The joints in the gneiss run about east, or nearly parallel with the glacial striæ, and this is also the direction of a number of long cuts and straight valleys or gorges in the gneiss, which have, therefore, an oblique angle to the strike. The bottoms of these depressions are filled with boulder clay, which, on the surface, has a structural arrangement parallel with the walls, apparently due to a process of expansion and contraction and of heaving, on account of the intense frost of this region. In narrow cuts or gorges the heaving of the clay was greatest along the sides, which had the effect of sorting out and throwing the boulders to the centre, where they formed rows as regular as if they had been placed artificially.

The direction of the joints in these rocks may also be that of dykes and veins, which, owing to decay and subsequent glacial action, would now be concealed in the bottoms of the depressions above referred to. At a projecting point on the side of one of them, however, and running parallel to its walls, I found some straggling veins of hard grey dolomite, weathering brown and holding scales of mica.

The rocks of the lower levels are well glaciated, and from upwards of twenty trials in various situations around Port DeBoucherville, the average course of the striæ across the south end of Nottingham Island was ascertained to be S. 30° E. (mag.), or only a few degrees southward of true east. That the direction of the glacial movement was towards the east is obvious from the contour of the *roches moutonné*, the mode of the fluting of perpendicular walls and of channels cut in the rocks, as well as by the direction of the curves of the semi-circular lines across the larger grooves themselves. A valley, with a south-eastward bearing, enters the head of Port DeBoucherville, and along it the grooves partake of the same direction, showing that while the low southern portion of the island was swept by a great glacier from the west, another was traversing it from the north-west. Nearly half of the boulders, stones and gravel of the drift are grey limestone, like that of the Manitounik (Cambrian) group, indicating the proximity of these rocks to the westward. The grey quartzite of this series is also well represented. One piece of this rock contained the characteristic spherical spots of a softer nature and lighter colour, which usually weather out into hollows on exposure. There are also fragments of black slate and red jasper, both of which have been found in the Manitounik group. Two pieces of fine-grained white quartzite were noticed, which may have come either from rocks belonging to this group or to the Huronian series. A fragment of red sandstone conglomerate was also observed, of the same kind as that which underlies unconformably the Manitounik rocks, and is so largely developed at Little Whale River and Richmond Gulf. (See Report of the Geological Survey for 1877, pp. 13 and 14 C.) No shells were found in the boulder-clay, but a few common species were abundant in a bank of stratified sand, having a height of about 8 feet above high-water mark at the head of a bay.

During the interval between our two visits to Nottingham Island, the observatory party saw a few reindeer, but the numerous tracks and droppings of these animals show that they exist here in considerable numbers. Several of their shed antlers were found, and all of them had the upper tines curiously hooked and curved inwards—a peculiarity which would be incompatible with forest life. We saw a few walrus when first approaching the island, and while the station was building, but they were quite numerous upon the ice which we passed through to the south of it on our return on the 20th of September. These animals accompany the ice during the summer, and its unusual prevalence in this quarter the present season was shown by the blighted condition of even the Arctic vegetation of the island. Arctic hares and foxes were seen, and both appeared to be abundant.

Among the more noticeable birds which breed on Nottingham Island, are the Arctic loon (*colymbus arcticus*, Linn), and the whistling swan (*cygnus americanus*, Sharpless). We killed four old swans, all moulting, and two young ones, nearly full grown, on the 27th of August, and the male, female and young of the Arctic loon.

At Port DeBoucherville I found distinct remains of a very ancient Eskimo camp in the form of heaps and circles of stones, like those of the modern Eskimo, on a raised beach at the head of what had been a cove. From what I have seen of the situations, which the Eskimo, in various places in Hudson's Bay and Strait, choose for their camps, there appeared to be little doubt that they had lived here when the sea-level was 20 to 30 feet higher than it is at present. On the rocks facing the open Strait, just south of the inlet, the more recent works of these people are well preserved, although they are probably upwards of 100 years old. Besides numerous rings of tent-stones and some shapeless heaps, there are here several rectangular walls a few feet high, and caches of a bee-hive form, each about 6 feet in height and 7 feet in diameter. Two of the latter are nearly complete, and are adapted either for storing meat or as hiding places or "stands" from which to kill game. A good photograph of one of them was obtained.

When we left Nottingham Island, it was proposed to place the next station on the south point of Mansfield Island, but the locality having been found unsuitable, the station was built on Digges Island, off Cape Wolstenholm, on our return voyage. As the geographical position of this station comes next in order, I shall now state the observations which were made during our visit to the locality. Heretofore the name Digges or Cape Digges has been applied on the sketch charts to several islands, represented as lying off Cape Wolstenholme. Our explorations went, however to show that there is only one island from ten to fifteen miles in length. The bare hills of which it is composed are divided into several detached groups by straight, transverse valleys, cutting well down towards the sea-level, thus giving the appearance of separate islands, when viewed from a distance. The greatest length of the island lies about east and west (true). As this is also the commonest direction of the strike of the gneiss, most of which is red, and also of the glacial striæ, the island has become divided by longitudinal valleys, some of which, too, were traced in nearly straight courses for several miles.

We found a good harbour on the south side of the island, about a mile from its western extremity, well sheltered from all quarters except the south-west, with good holding-ground and a convenient depth of water. The station was built on its south-east side, and placed in charge of Mr. A. N. Laperrière of Ottawa, after whom the harbour was called Port Laperrière. Only a narrow neck of land separates the head of the harbour from Hudson's Strait to the north. Between this and the western extremity of the island the hills have a rounded outline, and raised beaches, composed mostly of coarse shingle, form a prominent feature on their slopes, all the way from high tide mark to their summits, the highest of which is between 300 and 400 feet.

On the north side of Port Laperrière a light-colored quartzose band of gneiss contains numerous claret-colored garnets. Here the strike is N. 35° W. (mag.), but to the eastward of the harbour it is N. 45° W. (mag.), the bedding running in straight lines over a considerable area. At four miles east of the harbour, and towards the north side of the island, the gneiss strikes N. 50° W. (mag.). A well marked valley, with a chain of lakes along its bottom, comes to the south side of the island, about two miles east of Port Laperrière. It runs about east by north (true), and was explored for five or six miles without coming to the end of it. The general strike of the gneiss was parallel with the valley all along.

The red gneiss, which rises from the shore on the north side of the valley, running eastward from the head of the harbour, is cut by two parallel fissures, only 3 or 4 feet apart, with well defined, slickensided walls, the intervening mass simulating a vein; but it is composed of red gneiss, all divided into small, sharp, angular pieces by a multitude of joints intersecting each other in all directions, and often lined with green epidote, which in this region very frequently accompanies veins and

dislocations. These fissures run in a north-easterly direction, but curve about a good deal. They are accompanied by a small quantity of a handsome variety of red pegmatite, the quartz of which is blue, and the mass is occasionally streaked with bright green epidote.

Around the western part of Digges Island the course of the glacial striæ is from S. 70° E. to S. 75° E. (mag.); but in the interior it averages S. 55° E. (mag.), or with the general direction of the valleys.

We saw no Eskimo about Digges Island, but they appear to have visited Port Laperrière in recent years, as the remains of their camps were found in two or three places close to high tide mark. Some ancient camping places were also observed around this harbour, which, from their elevation above the present beach, the decayed nature of the larger bones lying about and the manner in which the circles of stones were embedded in the moss and overgrown with lichens, were supposed to be from 100 to 300 years old. Still more ancient works of the Eskimo were discovered in the valley which comes down to the head of the harbour. These consist of a row of stones lying in the vegetable matter at the surface, touching each other and running at right angles to the brook, at a contracted part of the bottom of the valley, which would be suitable for the Eskimo method of trout-fishing if the sea were 75 or 80 feet higher than it is at present. If the sea has receded as rapidly as 7 feet a century, these works would be upwards of 1,000 years old, and if the rate has been less they must be even more ancient.

The same day that we arrived at Port Laperrière (16th September) a she polar bear and her two cubs were killed in the interior of the island, about two miles from the ship. The cubs were somewhat larger than sheep, and were probably between seven and eight months old. Our party having approached them cautiously, one of them was observed sucking its mother. I examined the stomachs of all three, and found them to contain nothing but partially chewed grass. About four quarts of this were found in the stomach of the old bear and two and a-half and one and a-half respectively in the cubs' stomachs. I had been informed by some Eskimo and Hudson's Bay Company's people that the polar bears sometimes eat grass, and I had occasionally seen along with their tracks, dung which could scarcely have been dropped by any other animal, and which was made up of the remains of comminuted grass and other vegetable matter. The three bears referred to were killed on a grassy spot where they had spent some time, apparently for the purpose of eating grass, and this was probably their only object in wandering away from the sea. The presence of the newly swallowed grass in such quantity in the stomachs of all three convinced me that these creatures live, to some extent, on vegetable food. On the 30th of August, while sailing down the east side of Mansfield Island, we saw a large polar bear and cub running along the rocks about a mile back from the shore. Walruses were numerous around Digges Island during our stay there. They were always in the water and were generally seen in groups of from three to seven or eight.

We arrived at the eastern part of Mansfield Island, about mid-way down, on the morning of the 30th of August. Its even outline presented a remarkable contrast to the shores of Hudson's Strait. It resembled a gigantic ridge of gravel; but stratified rocks, in low horizontal ledges, appeared here and there, through the *débris*, at different levels. At one place, four or five miles inland, the island rises to an elevation of about 300 feet above the sea, and this was the highest point observed upon it. Small streams appear to run out upon the eastern shore, as narrow cañons are cut in the rock in a few places. The monotony of the eastern slope of the island is broken at one locality by the rocks projecting through the *débris* in a form resembling an old castle, with three towers on the left, and a wall broken through by embrasures on the right. A short distance to the south of this there is a cliff, with a distinct pillar on the left. These points are considered worth noting, as they have a bearing on questions as to the glacial phenomena of these regions. For many miles, the whole of the eastern slope of the island presents a succession of steps or small terraces, mostly too low to be distinctly counted, but there might be a hundred of them

between the sea level and the highest parts of the island visible. These appeared to be partly ancient beaches, and partly the outcropping edges of nearly horizontal strata. I landed at a point about the middle of the eastern shore of the island, and found the shore very flat, with shallow water for a considerable distance out. The rock proved to be a fossiliferous grey limestone, in rather thin horizontal beds. The fossils were obscure and scarce at the place referred to. Those collected, Mr. Whiteaves thinks, are Silurian. The rocks themselves resemble the Lower Silurian limestones of the Red and Nelson Rivers. I landed again near the south end of the island, and found the water very shallow in approaching the shore. No rock was detected in situ at this place; but a great extent of gravel and coarser shingle, derived from limestone like that found in situ further north was thrown into a succession of long, low ridges and terraces, all curving with the contour of the land. Behind most of the ridges I met with long ponds of clear, fresh water. A number of caches and "stands," built by the Eskimo, were seen along the shore of Mansfield Island, but none of these people were observed.

From the southern extremity of Mansfield Island we steamed to Cape Southampton, and thence coasted north eastward, in the hope of finding a suitable site for building an observatory station, but without success; and after making between twenty and thirty miles in that direction, we returned to the cape and passed round it to the westward, shaping our course thence for the opposite side of Hudson's Bay. The general character of this island, and the part of its shore which we examined, are quite like the eastern side of Mansfield Island. It has rather more vegetation upon it than the last named island, and much of the surface has a brown colour in consequence. Shallow water, having a light green colour, extends some distance out all along. The island slopes gradually up from the beach and is thrown into a great many small terraces. The highest point seen did not exceed 200 feet above the sea. I noted that the limestone is evidently exactly the same as that of Mansfield Island. Low cliffs in the upper levels break through the decayed mass and the *débris*, and horizontal ledges also make their appearance through the loose materials near the sea beach.

We did not observe any natives on the part of the island which we saw, but at four miles north-east of Cape Southampton there were three fresh houses of the Eskimo, covered completely with sods and moss, and having the doors built round with stones. About three-quarters of a mile to the north-eastward of these were five old Eskimo houses, built of stones and sods, with some sticks and bones lying on their tops.

Our first landing place on the western side of Hudson's Bay was Marble Island, but we had a distinct view of the land between it and Chesterfield Inlet. Judging from specimens which I have received through the kindness of Mr. George McTavish, of the Hudson's Bay Company, a portion of this coast is occupied by rocks, which may be referred to the Huronian series, among them being diorites, hornblende-schists and glossy mica-schists characterized by numerous cubes of iron pyrites. On the coast opposite to Marble Island, the last named rock appears to contain the veins of granular iron pyrites, an assay of a specimen from one of which, from Inari, was made by Mr. Hoffmann in 1879. (See p. 23 H., Report Geological Survey, 1878-79.) These glossy mica-schists were found on Deadman's Island, near the west end of Marble Island. From all that I have been able to learn on the subject, a set of rocks, very like those of the Township of Ascot, in the Province of Quebec, and holding similar pyrites veins, which are of great economic value, will be found in this part of the western coast of Hudson's Bay.

The harbour on Marble Island, which is resorted to by the American whalers, and in which we also anchored, is situated on the south side of the island, about two and a-half miles from the western extremity. The outer harbour is formed by Deadman's Island, about quarter of a mile long, lying across the front of a small bay. The inner harbour is a basin, which connects with this through a narrow gap in the rock with only about one fathom of water at low tide.

Deadman's Island consists of white and light grey quartzites and glossy mica-schist, striking N. 75° W. (mag). The glacial striæ on this island are well marked and run

S. 10° E. (mag). In the course of the day which we spent at Marble Island, I rowed round its western end and thence eastward along its northern shore for some miles. I also explored the interior and took some photographs between this side of the island and the harbour. The whole of the western part of the island consists of white and light coloured quartzite, bearing a strong resemblance to white and veined marble, from which circumstance it has no doubt received its name. Viewed from sea, the shores have a very white appearance, the rocks being free from lichens, &c., and the hills in the interior, which are rounded, are also pure white, and contrast strongly with the dark brown of the peaty flats and hollows. Even the boulders and coarse shingle forming the raised beaches remain quite white, and these beaches appear as conspicuous horizontal lines against the dark vegetable matter. The beds of quartzite are usually very massive. Their surfaces are often ripple-marked, the ridges and hollows varying much in size, being sometimes as fine and regular as the fluting on a washboard, and at others two or three inches apart. On the south side of the island, near the west point, the quartzite is of a beautiful lilac tint, some of the beds being more deeply coloured than others. The strike is here N. 80° W. (mag.), the dip being to the northward, at an angle of 80°. The surface of the rock at this place is marked by large green stains of carbonate of copper, some of them being 3 or 4 feet in diameter. They appear to be due to the decomposition of small quantities of copper pyrites in the quartzite.

At the north-west point of the island the dip is N. 75° W. (mag.), angle 45° and the striae here run S. 20° E. (mag.). This is also the prevailing dip in the interior of this part of the island. On the north shore of the island, opposite to the harbour on the south side, the dip is N. 60° W. (mag.), angle 40°. Not only does the strike vary considerably on the large scale, but the lines of stratification were in places observed to undulate a good deal on a small scale, while the general course of the beds was pretty straight, the minor variations appearing as mere corrugations of the darker lines of stratification on smooth sections.

Although quartzite was the only rock found in situ on the main island, so far as I had time to explore it, the *debris* of the glossy mica-schist with cubes of iron pyrites, was so abundant along the north side that I have no doubt it exists "in place" close by. A fragment of the peculiar brown-weathering dolomite with white quartz strings common in the Huronian series, was also found on this part of the island.

We left Marble Island in the evening of the same day that we arrived there (2nd September), and entered the harbour of Churchill on the 6th. The geology of this locality is described in my report for 1879, pages 19 to 21. After leaving Churchill we paid a visit of twenty-four hours to York Factory, from which we sailed for Digges, where we built station No. 5, as already stated, and after visiting all the other stations and building the one at Nachvak, which has been described in a previous part of this report, we continued our homeward voyage to St. John's, Newfoundland, which we reached on the 11th of October, and left the same evening for Halifax, where we arrived on the 14th and at Ottawa on the 16th of the same month.

GENERAL REMARKS ON GLACIATION.

It will be seen by an inspection of the chart, that Fox's Channel, in respect to width, general direction, &c., is a continuation of Hudson's Strait, and that the outlet of Hudson's Bay joins this great channel at right angles. It is much deeper than Hudson's Bay, the comparative shallowness and the uniformity of the bottom of which are remarkable features. If the sea in these latitudes were only about 100 fathoms lower than it is at the present time, James' and Hudson's Bays would become dry land, while the Strait would remain as a long bay, but with a slightly diminished breadth. The bottom of the Bay would have become a plain, more level in proportion to its extent than any other on the continent. The numerous rivers which now flow into it would traverse this plain, converging towards the north-east and falling into the Strait near Cape Wolstenholme, after having, perhaps, formed one immense river, flowing northward down the centre of the Bay, or probably nearer the East-main side.

During the "great ice age" the basin of Hudson's Bay may have formed a sort of glacial reservoir, receiving streams of ice from the east, north and north-west and giving forth the accumulated result as broad glaciers, mainly towards the south and south-west. It has been shown, in a preceeding part of this report, that the direction of the glaciation, on both sides of Hudson's Strait, was eastward. That an extensive glacier passed down the Strait may be inferred from the smoothed and striated character of the rocks of the lower levels, the outline of the glaciated surfaces pointing to an eastward movement, the composition of the drift, and also from the fact that the long depression of Fox's Channel and the Strait runs from the north-westward towards the south-east, and that this great channel or submerged valley deepens as it goes, terminating in the Atlantic Ocean. Glaciers are said to exist on the shores of Fox's Channel and they may send down the flat-topped icebergs which float eastward through the lower part of Hudson's Strait into the Atlantic. During the drift period, the glacier of the bed of Hudson's Strait was probably joined by a contribution from the ice which appears to have occupied the site of Hudson's Bay, and by another also from the southward, coming down the valley of the Koksok River, and its continuation in the bottom of Ungava Bay. The united glacier still moved eastward round Cape Chudleigh into the Atlantic.

Throughout the drift period, the top of the coast range of the Labrador, stood above the ice and was not glaciated, especially the high northern part. Further south on this coast, the range is lower and there may also have been more ice in this direction. Here the valleys and the hills, up to the height of 1,000 feet, at any rate, have been planed by glacial action, the course followed by the ice on the eastern slope having been down the valleys and fjords directly into the sea. In the southern part of the Labrador peninsula, the general course of the ancient glaciation appears to have been southward, varying to the eastward or westward with the courses of the rivers and valleys, and coming to the north shore of the Gulf of St. Lawrence, in a general way, at right angles to the coast line. On the island of Newfoundland, the glaciation appears to have been from the centre towards the sea on all sides.

ROBERT BELL.





